CLAUDE RYAN... *His Life Story*

POPULAR AVIATION

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IN THIS ISSUE

★

DUCK, SOLDIER!
The Story of Attack Aviation

★

FLYING AMBULANCES

★

I Learned About Flying — From That!

ENROLL AT CALIFORNIA FLYERS THIS SUMMER
WORK IN AVIATION THIS FALL

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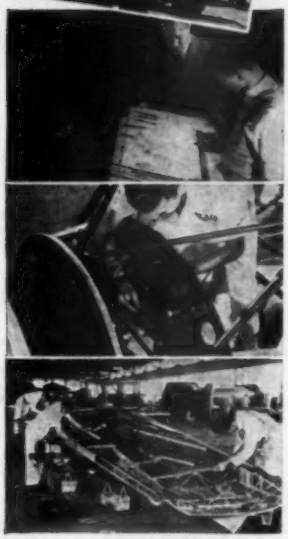

● *In common with all commercial aviation, this is the code of Parks Air College: "No compromise with safety will ever be permitted or excused."*

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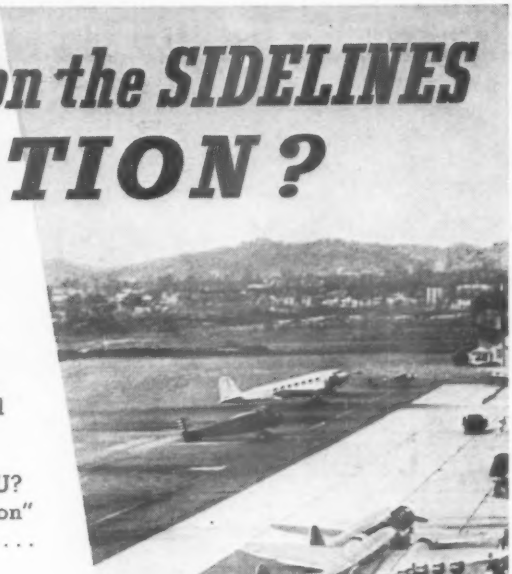
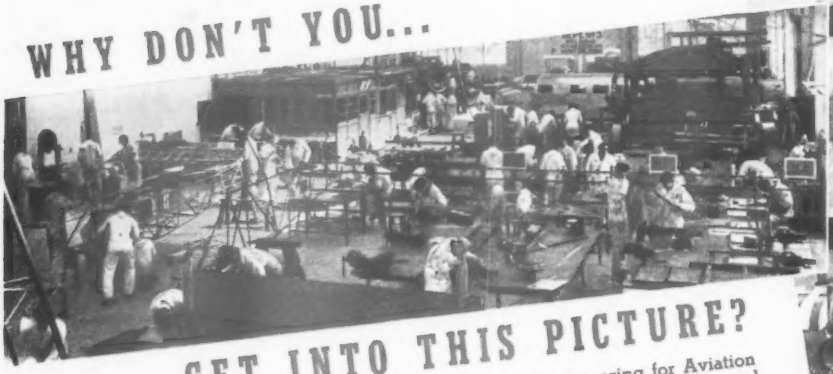


WHY DON'T YOU...



...GET INTO THIS PICTURE?

● Ask yourself "Why shouldn't *I* join these men who are preparing for Aviation careers?" They have *watched, read,* and *heard* the same things you have . . . and are *doing something about it* . . . by getting training in Aeronautical Engineering or Aircraft Mechanics.

● The picture above is a typical shop scene at Aero I.T.I. In this section and all other sections of the extensive shops, you use the same tools, operate the same equipment, and perform the same duties you'll find right in the industry . . . in private aircraft repair stations . . . at airline overhaul bases . . . in aircraft plants.

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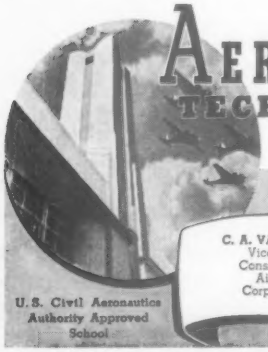

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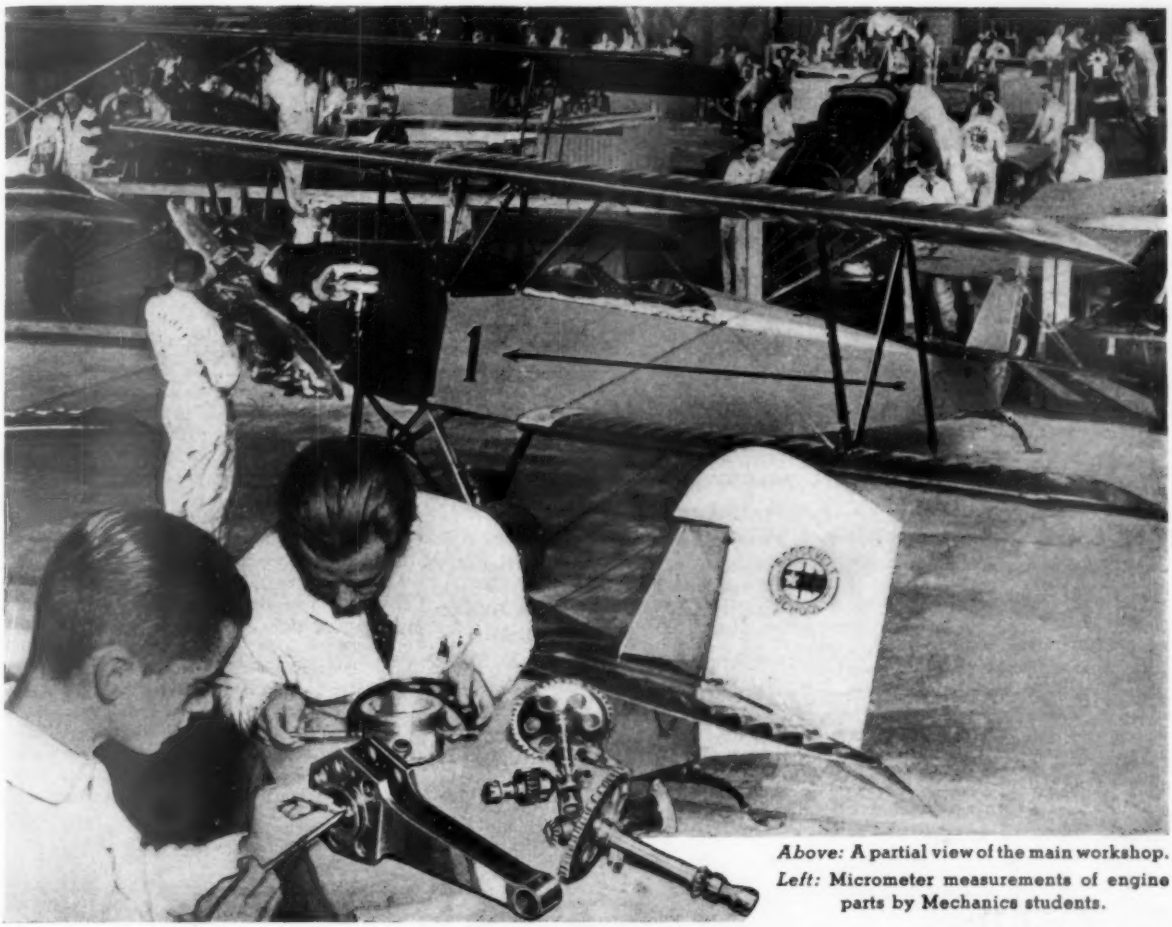

Above: A partial view of the main workshop.
Left: Micrometer measurements of engine parts by Mechanics students.

OPPORTUNITIES GROW FOR THOSE WHO KNOW

A prominent airplane manufacturer reports: "Volume of business for 1938 is estimated at $26,800,000."

Another prominent airplane manufacturer reports: "Present backlog of orders tops $30,000,000. Employment about 3,000 operating on a two-shift, 40-hour week."

A leading transport company reports: "Ready to inaugurate Trans-Atlantic service."

Those quotations from only a few similar items *prove* that aviation is established as one of the fastest growing industries in the world. They *prove* that its future is assured. They *prove* the need, stimulated by such rapid growth, of more properly trained men. They *prove* that opportunities *grow* for those who *know*. You can start *knowing* the day you enter

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P.A. May, 1939

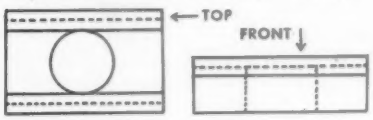
The Birdmen's Perch

HOW GOOD A LIAR ARE YOU? To every man, woman, or child in America the Birdmen's Perch offers the opportunity of testing in open competition his or her skill as a prevaricator. Simply send in the funniest yarn you can drum up about Gulf Aviation Gas. The monthly prize is a handsome diploma suitably inscribed and imprinted with a special illustration of *your* Whopper. It's the opportunity of a lifetime . . . act today!

MAJOR AL WILLIAMS, alias "Tattered Wing-Tips,"
Mgr. Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.

T. W. T. PROJECT NO. 2

We certainly started something when we printed that projection problem in February. Solutions—about half of 'em right—poured in from all over creation. Plus a few dares to print a really *hard* one. O.K., chums, here it is . . . not too difficult but tougher than the first. Remember to send in your answers for the official version.



If the top and front views of an object are as drawn above, what is the side view?

COGNOSCENTI CORNER

We take great pleasure in printing a list of recent contribs to our Puzzlers Association. With a few of their more pertinent remarks thrown in for good measure.

H. F. Rogers; Rolfe "What gets me is how did he manage to count the ducks so accurately?" Olson; Al Hines; George J. Wells; Arthur F. Seymour; Irving Pearlman; David Carr; Lester Eide and Glen "In the future please use smaller numbers as it takes us too long to find so large a flock of ducks!" Jacobs; John Riehl, Ted A. Axtell, Robert Prichard; Anthony Smaldone; H. L. Thomson; M. Schroen and J. Miller.

Also, Harmon Van Winkle; George E. Nettleton, Jr.; Jerome C. Baer; Charles R. Cole; John C. Faiella; Sam "Why don't your readers send in some good ones?" Sverdlik; Paul Bates; Johnny "After going nuts . . . I took it to my instructor!" Childs; Bob Newill, John M. McKeown, Fred "How about giving us something tough to play with?" Taraschi; Sam Anglin; Eugene Conklin; Frank Furry; George "How far off am I?" Ekeberg; Neal Scott; Don E. Henry; W. I. McCurdy; Stewart "Here's one *I* thought up!" Hartshorn; John Cadman; and Kenneth "I am still working on the (September) one about the bookworm!" Reed.

THOROUGH!

You've heard the one about the retired Indian scout who lived in a cabin in the woods with his nine cats. And who had exactly nine holes cut in the bottom of the door . . . because when he said "*Scat!*," he meant "SCAT!"

Same way with the refining engineers in the plant where we make Gulfpride

from 100% pure Pennsylvania crude. Those boys don't fool around, either. Not only do they refine the oil by ordinary methods that get all the easy-to-remove dirt and sludge. But in addition they swing into action with Gulf's famous and exclusive Alchlor process that digs down still deeper . . . removes as much as 20% *more* carbon formers. When that Alchlor process says "Scat" to oil impurities, it means it, too!

THIS MONTH'S WHOPPER

Dear Major:

You know I don't think I like your Gulf Aviation Gas on accounta' it's so good.

Was a time, before I started using it in my old crate, I could hedge-hop peacefully along a couple hundred feet up and see things happen down on the ground. Got a big kick out of it, too. Now that I'm using that dynamite juice extract o 'yourn, I only get to see them *start* to happen!

Take last Thursday: I was flyin' along quiet-like, sort o' reconnoiterin' above a lake where a lot of people was skating and I seen a man slip on the ice. But the blame alarm clock works that drive the prop were turnin' over so fast on your Gulf Aviation Gas that I passed out of sight over the horizon before he fell! Been worried ever since as to how bad he was hurt.

But the final straw cum yestiddy . . . I was hedge-hoppin' along as usual above the highway watching to see what I could spot when along cum my brother-in-law driving *my* new car. I leaned over the side to shake my fist at the mug fer takin' it without permission. As I went whippin' over him . . . Golly Moses . . .

he ran it off the road right at a telegraph pole!

Well sir, I threw that flying fortress (early Roman model) of mine into a bank so tight I thought not only the wings but my ears was going to cum off. But by the time I got 'er around not only had my nice, new, shiny car hit and demolished that telegraph pole but the wrecking car had arrived and towed the remains out o' there! (guess they musta' had Gulf Aviation Gas in the wrecker, too!)

H. O. Larson

P. S. They also had Gulf Aviation Gas in the ambulance that called around to get my brother-in-law after I finished with him. The way I know is that it got there between the time I hit him and when he started to hurt!

Gulf Oil Corporation and Gulf Refining Company . . . makers of

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This school stands squarely on its own feet, is financially independent without obligation of any kind to withhold our forward march in step with the industry. Our obligations are only to our students and to those with whom we do business and we are confident that our reputation is second to none in the entire country for square dealing and equipping of our students so that they can go out in the industry and make their future a decided success. We have never over-advertised our school in any way but have been content to advertise just what we have at all times and nothing more.

We have placed students with practically every branch of the industry in shops, maintenance and pilots, from coast to coast and from Canada to the Gulf.

We work with our students at all times to their advantage, hence, our graduates are received everywhere with respect and are given places readily at all times if their services are needed.

We successfully graduated in 1938 fifty-seven pilots in blind flying and practically every one of them is now profitably employed on airlines throughout the country.

We sincerely invite correspondence with all forward-looking young men who are interested in aviation. We believe we have what you want and you can get it here just as stated in our printed matter without fuss or feathers. *We bespeak for our school your earnest consideration.*

LET'S TALK IT OVER

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IF the stories we have been hearing lately become a reality, the amateur airplane builder will at last come into his own. Much is being said these days about a plan, of the Civil Aeronautics Authority, to set up a new airplane licensing category especially for the home-builders. Instead of the usual NC license, a ship licensed under the new plan would bear an NA. It's about time something along this line was done; we've been advocating such a thing for as many years as we care to recall. There has been a warm spot in our hearts for those enterprising lads up in Oregon who fought to the last ditch efforts to strangle their desire to build their own private airplanes. Admittedly, there is much to be said for both sides of this "feud", but the preponderance of evidence is in favor of those home-builders, many of whom have been flying their own unlicensed designs for years, without receiving so much as a scratch.

* * *

REMEMBER "The Ballyhoo Boys" in our March issue? Most of the fellows mentioned agreed largely with the entire thing. As the article pointed out, there is constructive and destructive press-agentry going on in the aviation industry all the time. This issue contains an excellent example of the constructive variety. Our lead-off article is almost entirely the work of Bill Wagner, Claude Ryan's hard-working and little-known press agent. Wagner spent months ferreting out a multitude of facts, figures and historic pictures. Many of the photographs, too, are products of Wagner's camera. Which is the kind of press-agentry the aviation industry can stand *much* more of.

* * *

WE have to chuckle a little at the "breath-taking" advancements claimed by manufacturers from time to time. Much has been made of the "discovery" of the three-wheeled landing gear now being seen on most new aircraft. We chuckle because even the Wright brothers used what basically was a three-wheeled gear. So did Glenn Curtiss. We chuckle, too, over the fuss that is made over "ultra-modern" slots and flaps. Handley Page over in England has held basic patents on slots for many, many years. We hesitate to guess just how old flaps

(*Continued on page* 83)

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ZOOM into Aviation

Do you want to get MAXIMUM TRAINING in MINIMUM TIME? Then Curtiss-Wright Tech is the place to go—it has an outstanding reputation, as any employer or graduate will testify. Mr. Donald Douglas, President of the Douglas Aircraft Co., Santa Monica, California, says, in a letter to Major C. C. Moseley: ". . . During the past several years we have employed a large number of your graduates and have found them to be eminently satisfactory. Efficient workmen capable of working with the care and precision demanded by the Douglas Aircraft Company are the product of thorough training and are difficult to find. You are to be congratulated on the fine job your Institute is doing in turning out such men. . . ." No higher compliment can be paid Curtiss-Wright and its graduates—nor is there any higher authority than Mr. Douglas. Curtiss-Wright Tech training ALWAYS pays, because its teachers are all experienced and up-to-date, its equipment is complete and modern, its spacious buildings are located on busy and famous Grand Central Air Terminal in the heart of the Aircraft Industry—and of greatest importance to you, its graduates are in demand and obtain ready employment and rapid advancement. Curtiss-Wright Tech is approved by the Civil Aeronautics Authority. Accredited by the State Board of Education. Endorsed by the Aircraft Industry and offers specialized practical training for your career in AERONAUTICAL ENGINEERING or MASTER MECHANICS. No flying involved. Approved by the U. S. Department of Immigration for non-quota foreign students.

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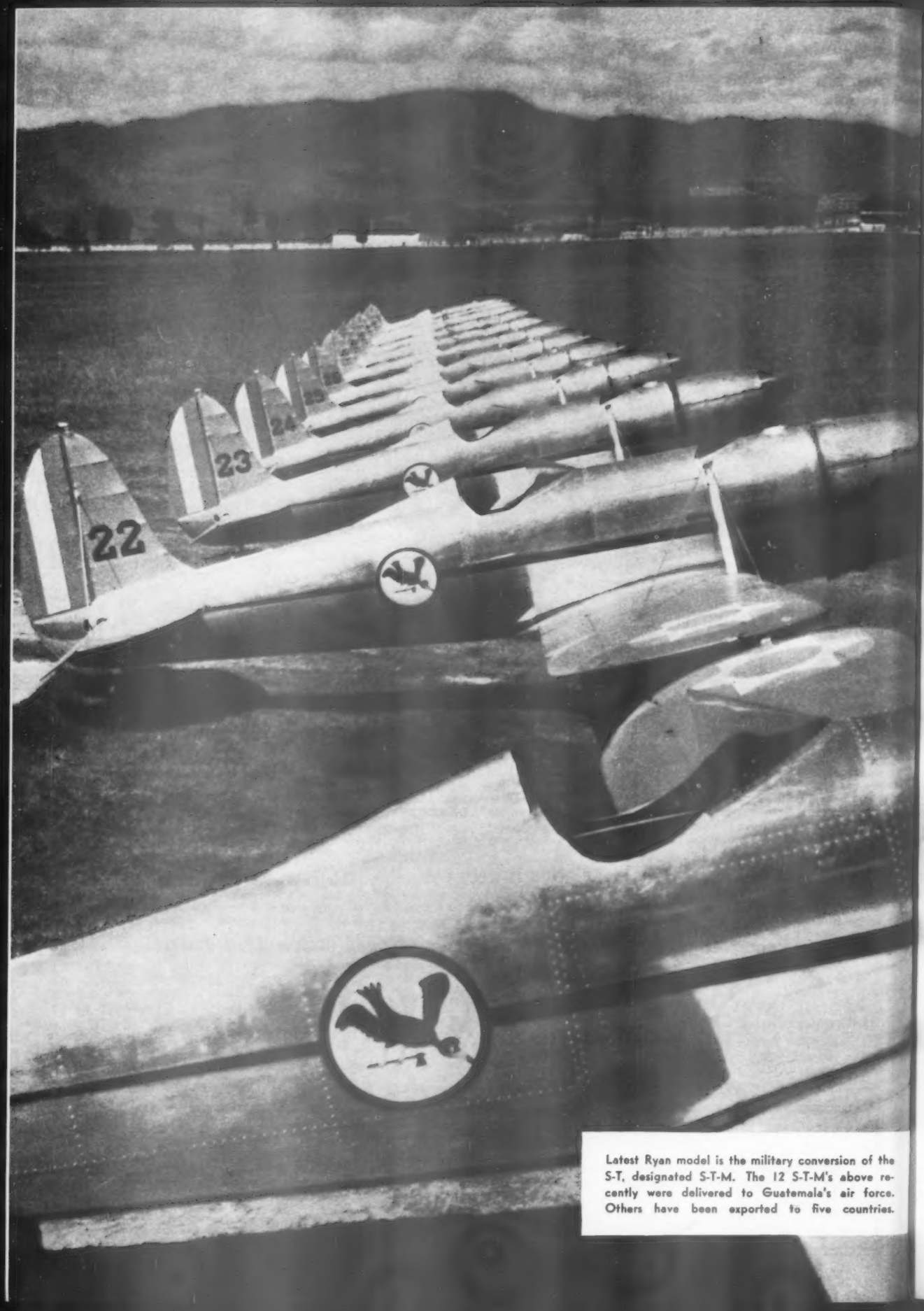


Latest Ryan model is the military conversion of the S-T, designated S-T-M. The 12 S-T-M's above recently were delivered to Guatemala's air force. Others have been exported to five countries.

Fittingly posed below are Claude Ryan, the first M-1 and the latest Ryan product, a sleek S-T trainer.

T. Claude Ryan—

HIS LIFE STORY

by WILLIAM WAGNER

If a young airman hadn't gone to a barber when he did, this tale might never have happened.

"NEXT". A young man of 24 wearing the uniform of an Air Corps pilot stepped forward and climbed, not into the cockpit of an Army DH as he had done for many months past, but into a barber's chair for a shave and haircut. And that particular step, taken in 1922, was more important to the young pilot, it later turned out, than any other single incident in his eventful life.

"Say, you're face is pretty windburned," commented the barber as he applied the lather. "What do you do, ride a motorcycle?"

"No, I'm a pilot", came back the reply.

"Well, then", continued the barber, "this might interest you. 'Jack Mason,' a pilot here in San Diego was doing real well until he was sent up for a 'stretch' for smuggling Chinese. Nobody has taken over his old field yet and there might be an opportunity to make a go of a flying business."

As the barber put on the finishing touches of his tonsorial art, the Army pilot paused to ask exactly where "Jack Mason" used to operate his plane. Ten minutes later found T. Claude Ryan at the waterfront on San Diego Bay stepping off "Mason's" landing strip along the bulkhead to be sure he could get a Jenny in and out without taking down a few smoke stacks and electric wires. Told that the property was controlled by the Harbor Department, his next stop was at the office of Joe Brennan, Harbor Master. Learning that the rental of the field would be $50 a month, Ryan replied that he didn't expect to take in that much money in a whole month.

"I'll tell you what we'll do," said Brennan. "We like to help new businesses get started and I'd like to see a reliable flyer with a good plane operating here. Suppose you try it and see how it goes; then we'll decide what your rental will be."

In another half hour, Ryan was at Rockwell Field, just across San Diego Bay, but instead of taking an SE-5 pursuit, he made arrangements to purchase one of the wartime Jennies with which to start a business of his own using the improvised runway along the harbor bulkhead for an operating base.

Claude Ryan, from that humble be-

1 This picture was taken at Parsons, Kas., where young Ryan awaited the arrival of Cal P. Rogers, early distance flyer.

2 Finally accepted as a flying cadet by the Army, Ryan got his first real flight training at March Field, Cal., where this picture was made. This confident pose is dated 1919. Ryan was one of the 30 (out of 75) that graduated after 50 hours.

5 Modern airliner (for 1924) was this Hisso-powered Ryan-Standard. Ryan (in cockpit) piloted his line's passengers.

6 This is a Ryan-Standard airliner leaving San Diego for Los Angeles. Operated by "Ryan Airlines, Inc.", the line started operations March 1, 1925. One way fare was $17.50, round trip $29.50 ($10.80 today). One round trip ticket paid expenses.

9 This is Claude Ryan in 1927. Though only 29, he was operating an airline and manufacturing acceptable airplanes.

ginning with one Jenny airplane, a piano-box for an office and a lot of ambition, went on to establish the organization which started the first year 'round scheduled passenger airline service, built planes for the early airmail lines, surveyed the important Pacific Coast airway between Los Angeles, San Francisco and Seattle, and manufactured the original series of Ryan monoplanes which became world famous when Lindbergh flew the Atlantic in the *Spirit of St. Louis*. Today he concentrates on the production of the sleek, modern, low-winged metal Ryan S-T sport and military trainers and Ryan S-C cabin monoplanes. The company's activities also includes the operation of the highly regarded Ryan School of Aeronautics, the oldest government-approved flying school. Lindbergh Field, San Diego's aeronautical pride, is prominently occupied by Claude Ryan's thriving little industry which, incidentally, has been expanding rapidly lately with new parts orders. . . .

Claude Ryan was born in Parsons, Kansas, January 3, 1898, and attended grammar school there until his parents moved to California. Like all boys of his day, Ryan was an avid reader of the *American Boy* and other boys' magazines in which there were regular series of aviation stories. However, he didn't actually see a plane until the fall of 1911 when Cal P. Rogers flew over Parsons in his Wright biplane while making the first coast to coast flight.

Moving to California, where his parents had purchased an orange ranch, Ryan continued aviation study through the pages of *Aerial Age* and all the suitable books he could find. When attending high school and college he spent his summers driving a laundry route so that when the opportunity finally came he would have the money to learn to fly.

With the declaration of war, Ryan tried to get an appointment as an Army or Navy aviation cadet and although he passed all the rigid examinations, was unable to obtain a waiver on his age. Not to be so easily discouraged, Claude decided that if he could learn to fly at

(*Continued on page* 14)

3 Upon graduating from March Field, Ryan chose the proferred forest fire patrol in place of advanced training at Kelly Field. He is pictured here (date: 1921) with Patrol Ship No. 13, an old DH.

4 Ryan (far left, standing) and B. F. Mahoney (far right, standing) later joined forces and built Lindbergh's famed Spirit of St. Louis. This picture is dated 1924.

7 Ryan's Los Angeles-San Diego Air Line acquired this Douglas "Cloudster" in 1925. The ship later was converted to a cabin plane seating 10 passengers. As shown above, the "Cloudster" had three open cockpits, two holding three persons each.

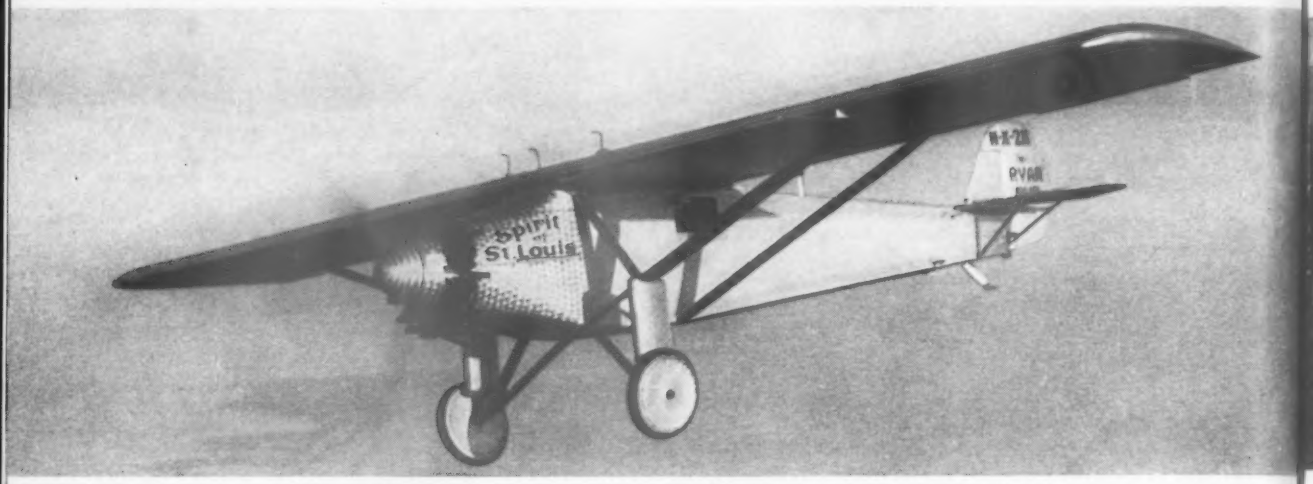
8 Close friend of Claude Ryan was the late Frank Hawks (left). Hawks bought the first cabin "Brougham" Ryan built.

10 Today, at 41, Claude Ryan looks only a little older than he does in the 1927 photograph on the opposite page. He is a typical success, heads a thriving aircraft factory and school.

11 Air-minded and active flyers are the Ryan boys, David (left) and Jerry (right). A third son, Stephen, was two months old as this was written.

12 This is the Ryan M-2, product of 1927. Notice the great similarity between this ship and the "Spirit of St. Louis" below. The engine is a J-5 Whirlwind.

13 This is the M-1 mail plane in which Ryan out-raced Oakley Kelly, famed Army pilot. The M-1 could carry 800 lb.



16 By far the most famous Ryan (or any other) airplane ever built was Lindbergh's "Spirit of St. Louis". Ryan had just sold his share of the business to his partner, Mahoney.

(*Continued from page* 12)

a civilian school perhaps they would give him a waiver on the age requirement. Aided by his father, who saw the possibilities aviation would offer as a career, Ryan early in 1917 went to Venice, California, to enroll at the American School of Aviation.

Equipment there consisted of a Curtiss pusher-type plane and an unnamed tractor-type ship powered with a 75 h.p. engine, which might have been the great-grandfather of the OX-5. After inspecting the school, Ryan decided to give it a try and paid in $500 for 400 minutes of instruction—which was supposed to be sufficient experience to make him a finished pilot.

When Ryan started his training he found the planes in terrible condition and the school on very wobbly financial legs. There were 12 students all full of enthusiasm, in spite of the fact that the tractor plane had cracked up the previous day and was even then being worked on by the students. Another discovery was that the pusher plane wouldn't actually fly. The school planned to give 150 minutes of dual instruction in taxiing the pusher (all of which was charged out as "flying time"), then to change to the tractor plane for the actual flying.

Generally the planes would be used for two or three days, then cracked up so badly that it took as many weeks for the students to get them back in shape.

In the first six months Ryan got hardly any training at all; in fact, he only taxied with the instructor a few times in the pusher. The sole instructor recently had had a crack-up and had become super-cautious to the extent that he would only fly the tractor plane off the ground 15 or 20 feet, then land straight ahead without even making a turn. Between the poor condition of the planes and the complete lack of any real instruction, the students were pretty much up in the air over their situation.

About this time Al Wilson, who had been hanging around the airport, suddenly decided it would be easier to fly in the war than to pack a gun. Whereas the students at Venice had accomplished almost nothing over a period of months, Al went up to Riverside, California, to

19 The picture below was taken in 1922 and shows San Diego's waterfront and (in circled area) Claude Ryan's improvised airport. Later, he moved farther up-bay.

14 First Ryan cabin design was the "Bluebird" of 1927. Powered with a Hisso, the "Bluebird" was a development of the M-2. Later, one of the first air-cooled radials replaced the Hisso.

15 One of the finest, most reliable ships of its day was the B-5 "Brougham". Closely resembling Lindbergh's ship, the B-5 was popular with operators.

17 Currently popular is this three-place S-C, powered with a Warner.

learn from Swede Meyerhoffer. Three weeks later he dropped into the Venice field a "full-fledged pilot," having made one solo flight, and took over the job of instructor.

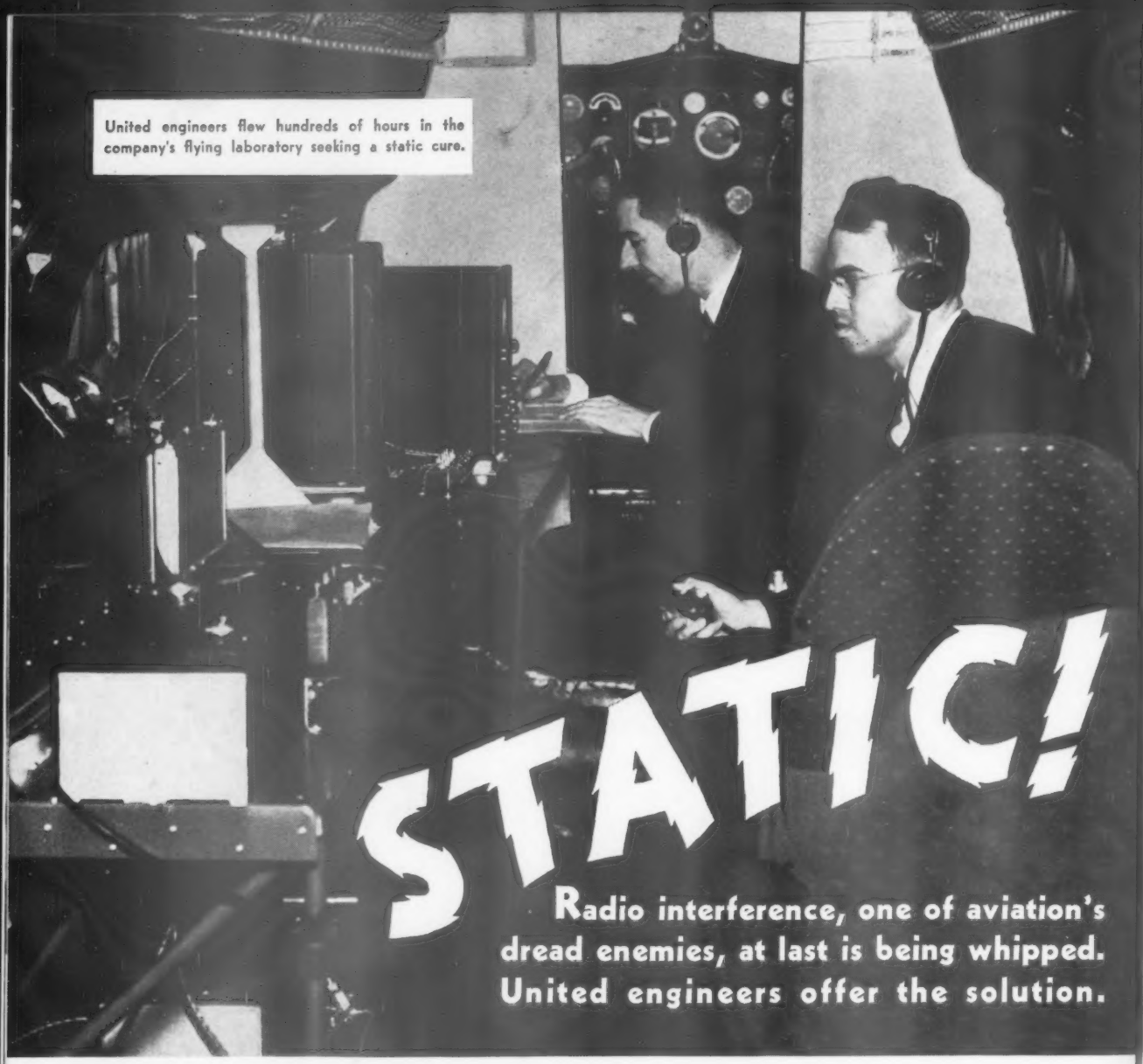
Finally, after months of waiting, Ryan got his first flight with Al Wilson. Then, less than a week after Claude's first instruction, the plane cracked-up, which completely stopped training for another four months.

In all, Ryan had seven or eight flight lessons with Al Wilson, but it became very apparent that the school was about ready to "fold" any day. Ryan had received only about half of his 400 minutes instruction and, knowing that he would lose his money anyway, was determined to have one solo flight for his $500.

(*Continued on page* 64)

18 This is the Ryan airport in 1926. Above are his airline's Ryan-Standards and Douglas. The inset at right shows the effect of a violent rainstorm on Ryan's airline terminus. The almost-floating Jennies were stored rent-free "to bolster up appearances".

20 Compare the Ryan establishment today (below) with his "airline terminal" of 1926 (above). The ships lined up below are S-T's and one S-C at extreme right.



United engineers flew hundreds of hours in the company's flying laboratory seeking a static cure.

STATIC!

Radio interference, one of aviation's dread enemies, at last is being whipped. United engineers offer the solution.

EARLY last Christmas morning, United Air Lines' crack eastbound *Continental*, the overnight sleeper, sped through the greying light of dawn at 9,000 feet over frozen Iowa fields. Capt. Harvey Berger and his flight officer in the cockpit of the Douglas were flying on instruments riding the beam through clouds to Chicago, which was reporting favorable weather conditions. Gradually the light snow through which they were flying thickened appreciably, for the ship at that point was in the vicinity of the cold front.

For some time past there had been an overtone of "frying" noises in Berger's earphones but, as the plane neared the cold front, these noises built up until two-way voice radio between the plane and Chicago radio station was garbled and the on-course signal from the directive beam's long wave transmitter was intermittently drowned out by the swelling, crackling cacophony as if one were hearing the frying of a gargantuan skillet of bacon over a great fire. Captain Berger leaned over and flipped to "ready" a small toggle switch on the instrument panel of his ship. A tiny green light flashed on. Again Berger flipped the switch and a bright yellow light winked on. Instantaneously the frying noises died out and the on-course signal shrilled clearly through the earphones while the Chicago operator's voice came across short waves as clearly as if he were talking across the living room. Thus, with the simple flip of a finger was aviation's one-time bugaboo "static" dealt with efficiently.

Here is Captain Berger's own report of the incident on Christmas morning:

DATE—*12-26-38*
TRIP NO.—*4-25*
PILOT—*Berger*

REMARKS—*While flying between Omaha and Chicago we encountered moderate to heavy static on both the long and short wave. We encountered this static approximately over Montezuma. We were in the vicinity of a cold front and the static was so severe we were unable to get a message through to Chicago. We released a cartridge. Immediately the static cleared up on both long and short wave and stayed clear the remainder of the trip.*

Back in 1927 United's predecessor company, Boeing Air Transport, began flying two-passenger mail planes across the California-Chicago division of the coast-to-coast airway. Soon executives of that company realized the critical need for quick radio communication between planes and ground stations. Nothing but code was available for aircraft then and that required special operators for which there was no room on the small planes flown by Boeing. Radio telephony was branded as impossible for aircraft use after repeated experiments to adapt it for aviation had proved fruitless but United's engineers went to work and in less than a year had developed and made installation of a successful plane-to-

by ROBERT JOHNSON

ground voice system which was the granddaddy of our present day aircraft radio the world over.

The big problem in developing this system was the elimination of static interference from mechanical sources—the ignition system of aircraft power plant and the friction of metal parts moving against each other, etc. When this obstacle had been overcome by engineers' preparation and radio began flying with the mail, there was discovered a natural weather static which no amount of binding or shielding could suppress. At first, with contact rather than instrument flying and relatively low cruising speeds, the weather static problem was a minor one but in 1933, when high speed multi-motored planes were introduced and the swing was towards instrument flying, the picture changed. Snow static became a major problem and aviation engineers turned toward working out its solution. Prior to then, as a matter of fact, United had started work on the static problem as early as 1930 Engineers of the National Air Transport division of the New York-Chicago airway began attempting the reduction of static interference and, in 1932, the line equipped its entire fleet with rubber-covered antennae as a protection against static. That method of protection was based on the prevalent theory that static was caused by the impinging of electrically charged moisture particles on the metal surfaces of airplanes in flight. But the rubber covered antennae did no good and engineers found themselves still as far as ever from the solution of the elusive static problem.

The next step came with the suggestion by RCA in 1935 that airlines benefit from Great Lakes Steamship experiment and test metallic shield loop antennae. Both United and TWA developed and experimentally tested these loops with fair to good results and later the Department of Commerce, recognizing the static protection of the loop, notified all lines to install these shield antennae as standard equipment.

Meanwhile the static problem became more serious. It was discovered that dust under certain conditions could cause static as well as could moisture particles. By 1936 United had pushed static to the top of its list of "must" experimental projects and the entire resources of the company were devoted to the problem. That was when that airline established its well-known flying laboratory by taking a standard twin-engined Boeing 247-D out of schedule and assigning it permanently to flight research and replacing its upholstered chairs with work benches, electrometers, recording meters and an oscillograph.

In February, 1937, this plane set out in a quest for static. Aboard were H. M. Hucke (then United's chief communications engineer and now with the Civil

(*Continued on page* 80)

P. C. Sandretto (right), head of United Air Lines' research laboratories, points out an antenna socket in the tail of a Douglas airliner. The pilot is Capt. Don Brown.

Years of research preceded the discovery and adoption of the static suppressor. Below are two views of test equipment installed on United's Boeing flight research ship.

George Noville (he flew with Byrd) is shown with Tomick and the author (l. to r.)

I Learned About Flying

by GARLAND LINCOLN

This is the story of a pilot who had a harrowing experience that taught him a lesson. It is our hope that other airmen will profit by his mistake.

THE cameraman I had along, Charles Marshall, wrote his will and last testament nine times.

Frank Tomick (my co-pilot) and I died several deaths.

It was during a two-hour cruise over Fairbanks, Alaska, in August, 1937. At least, most of it was over Fairbanks. The ceiling was zero, visibility was zero, our radio was out, we were using up our last few gallons of gasoline and there wasn't any place to land. We had come up 500 miles from an Indian village 150 miles west of Whitehorn, Yukon Territory, bound on rescue work.

Maybe you remember. Sigismund Levanevsky, the famous Russian aviator, and a crew of five, had been pushing a four-motored Russian job over the hump from Moscow to Los Angeles—smack across the Pole. One flight had been successful and there was talk of a Moscow-America airline.

The four-motored job was making a survey. She'd lifted out of Moscow, streaked across the Pole, and was winging it down the 148th meridian some 500 miles south when the world last heard. Jimmie Mattern, with an airplane, was looking for the ship, which was a land job and which was believed to have gone down because of an icing condition. There were other planes from all parts of Alaska scheduled to fly into Point Barrow (where Will Rogers and Wiley Post lost their lives) to continue the search.

The report came down from Point Barrow that there was no hope of making an adequate search unless the flyers had gasoline—and there was none at Point Barrow. Harbors were packed with ice, the seas were filled with icebergs and pack ice and it was impossible to get to Point Barrow with vessels. So the only answer to the problem was aerial—a cargo ship must be equipped with tanks and sent north.

The only ship available was a trimotored Ford at Los Angeles. A 14-passenger job with three Wasp "C's" giving about 1,500 h.p. total. I was

No. 1

It is the belief and hope of the editors that this series of articles might save the life of some not-too-seasoned pilot. Each author will be a bona fide licensed pilot.

chosen as pilot, Frank Tomick as my co-pilot and Charles Marshall, one of motion pictures' best known flying cameramen, assigned to go along to make motion pictures of the rescue attempts—and possibly of the rescue. I know none of us would have stepped into that ship had we known what lay ahead.

The trip north was financed by the head of an American oil company. Under my supervision, the seats were taken out of the Ford, gasoline tanks capable of holding 1,800 gallons and oil tanks with 450 gallons capacity were installed. I lined up a lot of Commander Byrd's equipment, including a rubber boat, sled and ice picks, and stowed it away, and we were ready to go.

Bear in mind that the gasoline tanks so filled the rear compartment that the door was no longer usable and to get in and out of the ship it was necessary to use a steel ladder to climb on top. From that point we dropped in through the emergency hatch over the pilots' cockpit. In case of trouble, we had to go out the same way.

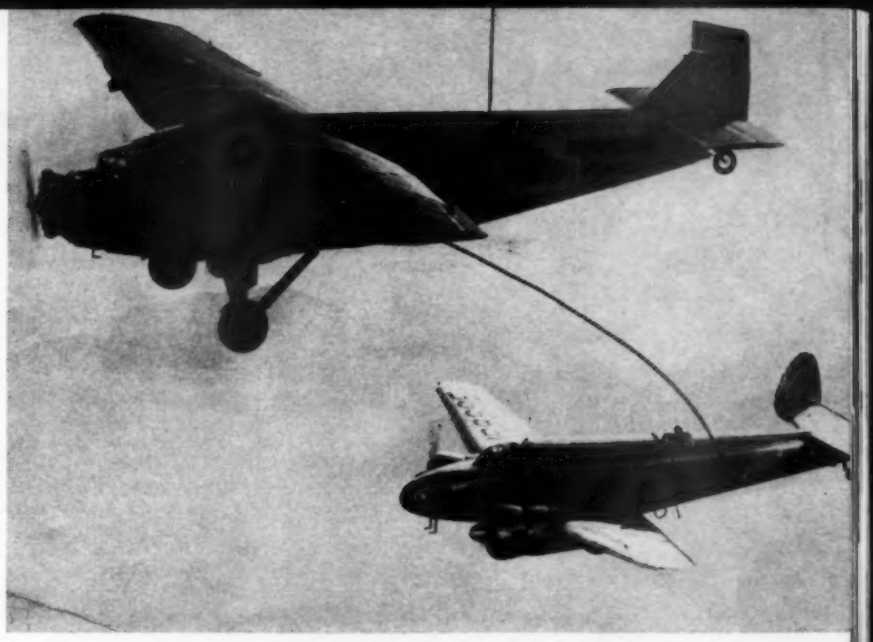
The trip from Los Angeles to the Indian village which I have mentioned was uneventful, save that we encountered a lot of bad weather. But we pushed right through that. We were on a rescue mission and the chief item, to our way of thinking, was elapsed time. I really poured the coal to the old tri-motor and we stopped only for re-fueling, and then not for long. Gasoline and oil were available at Fairbanks so we were traveling with empty tanks, as far as freighting was concerned.

When we finally found our way into the Indian village, we were told:

"You'd better not go on. Weather's bad. Fog's right down on the ground."

"But we have to go on," I told my informers. "To save the Russians, Mattern and others in on the search must have gasoline."

Ceiling was zero at this point and we stuck around for just a little while hoping for a break. We didn't get it. So Frank, Charlie and I climbed up the steel ladder, dropped into the cockpit and took off into the soup. I climbed for about



The upper ship is the tri-motored Ford in which the author had his harrowing experience. Lincoln was flying north to refuel Mattern's ship (shown above in test contact).

45 minutes after taking off as there were a lot of mountains around and I didn't want to get messed up in them. But, at 15,000, we were still in soup. We never came out of it at all.

I had done a little ground work and was flying by dead reckoning. Luckily, the same weather conditions that brought the fog and clouds had brought no wind. The air was dead, so that I merely had the job of figuring my course with three compasses, allowing for variation and deviation. If there had been any wind drift, I have no idea of where we'd ended.

We were on course about two hours when Marshall said:

"The radio's dead."

About this time we were beginning to ice up a little, so I guessed what had happened. The antenna had iced up. But I hadn't guessed all of it. It had iced up and broken off. So we just played we hadn't brought along a radio. I watched my instruments plenty carefully.

I'd done a lot of blind flying before, but never had I been so dependent on instruments. We pounded on north. I watched the minutes ticking by, checking my airspeed indicator among other things, and trying to figure what I must be over if I was on course. Then, about 125 miles south of Fairbanks, I got my one and only break. We came out of weather into a comparatively clear section. The ground wasn't visible, but I could see mountains. I recognized them, from previous trips, as a range bordering the Pacific at Sitka.

Then we ran into soup again. I flew for a few minutes over an hour, and then throttled back. I signalled Frank and Charlie to come close.

"We're over Fairbanks," I said, "and we're going down."

I began my glide.

"How do you know?" Tomick asked.

"I just feel that way," I said. That was all I was ever able to say about the strange hunch I had. I went down and down and down, until instinct told me that if I didn't level off pretty soon I was going to plow into something. The

(*Continued on page 74*)

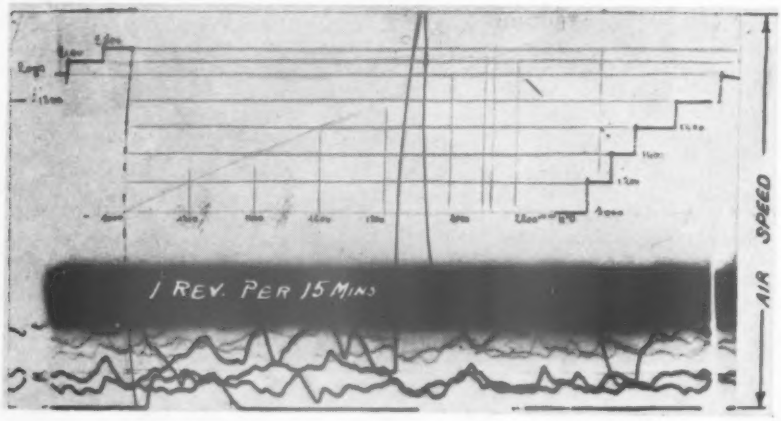
From That! No. 1

RESEARCH

by JOSEPH S. EDGERTON

Of the world's leading nations, the United States probably ranks lowest in aeronautical research.

Test Pilot Lloyd Child made international news recently when, on a test flight, he dived the French fighter above 575 m.p.h. Below is his barograph chart. The vertical line in chart's center marks ship's acceleration past 500 m.p.h.



A DRAMATIC story of international rivalry, espionage and scientific competition almost without parallel lies behind the request of President Roosevelt to Congress for funds with which to finance the largest aeronautical research program in American history.

Behind the scenes in this drama move thousands of research engineers and scientists of many nationalities, international spies and agents, and the anti-spy forces of the Federal Bureau of Investigation, the Secret Service, the Army Intelligence service and the office of Naval Intelligence. Large in the background looms the figure of Col. Charles A. Lindbergh.

In the visible foreground are aircraft plants now being geared up to capacity production under the great national defense program to turn out the larger, faster and deadlier aircraft made possible by organized research; the test pilots who are startling the world with such performances as power dives at speeds (highly controversial) of almost astronomical proportions; and the service pilots who themselves are chalking up new records in the service-testing of new military equipment.

Aeronautical research, it has become obvious to leaders of the world powers, constitutes the backbone of air power. It is just as apparent that air power has become the decisive factor in military strength and that the country with the greatest air force holds the winning combination on the chess-board of international politics. The result is an international race in aeronautical research without parallel even during the hectic days of the World War.

To put the United States into this race, President Roosevelt has asked Congress to appropriate or authorize the contractual obligation for aeronautical research during the coming fiscal year of a total of more than $15,000,000.

Testifying before the House Appropriations Committee in support of the research program, Dr. George W. Lewis, research director for the National Advisory Committee for Aeronautics and president of the Institute of the Aeronautical Sciences, told the committee that aviation today is "the most important subject that is now facing every nation in the world." Aviation, he said, is "changing the lives and thoughts of men" and is altering "our whole concept of government and power."

"There is no question," Dr. Lewis said, "that the present world situation is due entirely to the unprecedented development of military aircraft in one or two European countries. One country has made tremendous efforts during the past two years to build up its air arm. It has built giant 'shadow' factories which were built and equipped by the government and erected adjacent to large manufacturing plants, like those of automobile companies. These factories are building parts and completed airplanes, so their production is going up daily."

Dr. Lewis told the committee that Germany now is equipped to produce between 600 and 800 airplanes a month,

IS POWER

He explained that in addition to the tremendously increased numerical production of aircraft abroad, all of the major European powers have greatly increased their research facilities and personnel.

"One country," he testified, "employs 1,800 men in only one of several laboratories. At Langley Field we have about 450. I would say that at the present time they have in one country four times as many men engaged in aeronautical research as we have in our entire country, and that is reflected in the performance of their aircraft.

"I have received within the last week or 10 days information that there is a foreign airplane that is capable of flying at 420 m.p.h. That is the fastest military airplane in history. A speed of 440 m.p.h. was attained at one time by a small racer in Italy, but that was a very small airplane, equipped with two engines having a total of 2,800 h.p."

On the basis of recent research developments, Dr. Lewis stated, it is regarded as possible to construct airplanes with top speeds in excess of 500 m.p.h. Although it is claimed that speeds considerably in excess of 500 m.p.h. have been attained by new pursuit airplanes in power dives, no accurate measurements of such speeds have been made and the matter is, to say the least, controversial.

Test Pilot H. Lloyd Child of the Curtiss-Wright company, recently made a power dive at Buffalo in one of the new "pea-shooters" (being built for France) in which it is claimed he attained a speed estimated at 575 m.p.h. The automatic recorder went off the chart at 500, it was reported.

A few days later 2nd Lt. Troy Keith, Army Air Corps Reserve, flying an airplane of basically the same type at Barksdale Field, La., had oxygen trouble at four miles and passed out. When he recovered and managed to pull out at around 9,000 feet, he found a buckled wing and the speed indicator jammed at 500. How fast? Again, no record. News reports quote Barksdale Field pilots as hazarding the "scientific guess" the maximum may have been 670 m.p.h.!

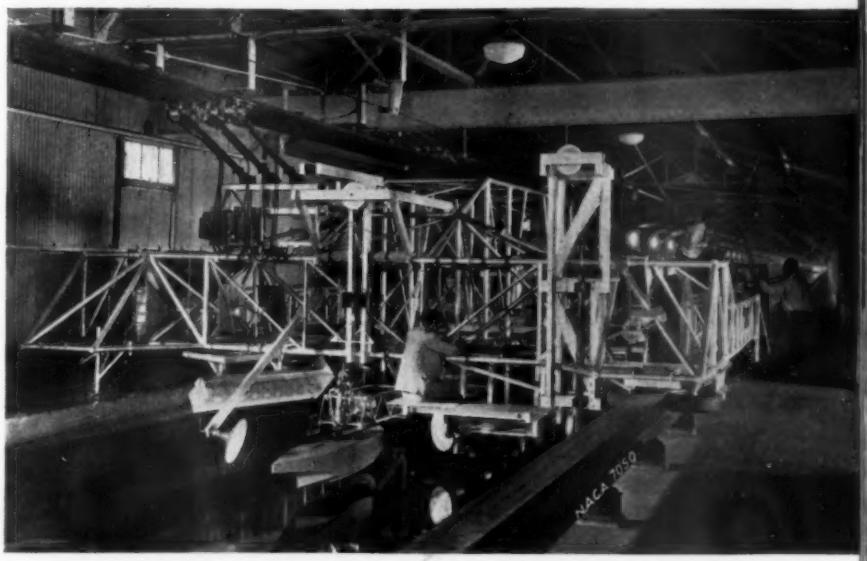
According to testimony placed before Congress in connection with the request for a 700 per cent jump in our national research bill, Italy has made particularly rapid progress in aviation development and has built, near Rome, an aeronautical research center called Guidonia. Dr. Lewis described Guidonia as "a whole city devoted to research." Italy, in addition, is fostering a great program of aeronautical research in its universities, Congress was told.

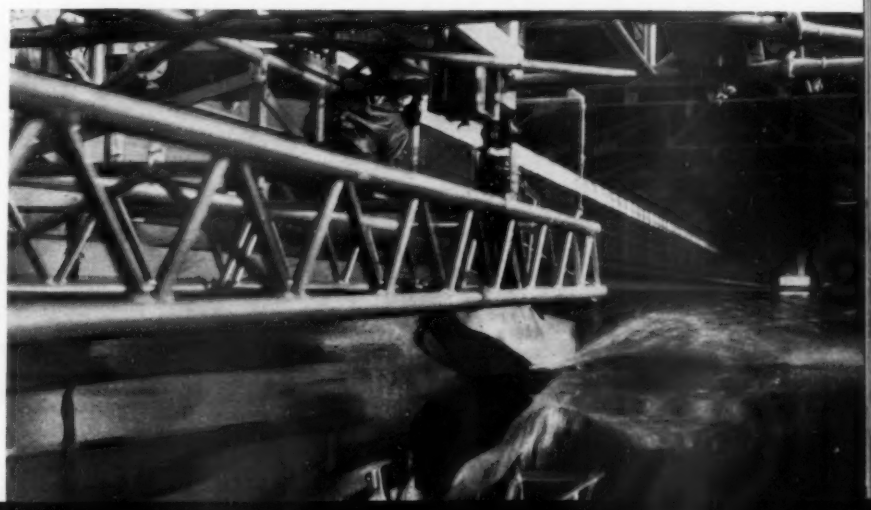
Much of the information on aeronautical developments in Europe, it has been revealed, has been obtained by the National Advisory Committee for Aeronautics from Colonel Lindbergh, a Committee member, who is credited with having submitted to the N.A.C.A. a series of very comprehensive reports on his observations in Germany and elsewhere.

Colonel Lindbergh probably could have done even more valuable work for the United States Government had it not been for a storm of criticism in this country from misinformed and prejudiced self-appointed judges of the Colonel's conduct abroad. This criticism, culminating in a speech by Secretary of the Interior Harold Ickes criticising Colonel Lindbergh for accepting a medal from the German government, is credited with having cut short the Colonel's observation tour in Berlin for the N. A. C. A.

Associates of Colonel Lindbergh on the N.A.C.A., describing Berlin as "the world center of aviation progress," say that he could have been of inestimable value to the United States in his capacity of a highly qualified technical observer working openly in cooperation with German aviation officials. These associates have described Colonel Lindbergh as "a loyal citizen who has sought only to serve his country."

Based upon its information of European affairs, gained in part from Colonel Lindbergh, the N.A.C.A. in its recent annual report said: "The sudden and rather general appreciation of the potentialities of modern air power is the most significant event that has occurred in modern time: in connection with strengthen-





Uncle Sam's research needs vast expansion to catch up with the rapid growth of world aeronautics. Above and below are typical research projects being worked out by the N.A.C.A. in that organization's comparatively tiny laboratories at Langley Field, Va.

In the free-flight wind tunnel, N.A.C.A. engineers investigate stability and control tendencies on a model.

ing the desires of peoples to avoid war. Air power at the present time is a dominant factor in the strength of a nation and in enabling it to maintain its independent existence and territorial integrity. Accepted theories of warfare give a steadily increasing place to air power."

Solemn warning to the United States was seen in the growth of Germany to a dominating position in world affairs because of her development of air power and its threat to the security of Europe.

"The crisis in Europe in the fall of 1938 brought forcibly to world-wide attention the overshadowing influence of air power in international affairs," the N.A.C.A. reported. "The realization that aircraft had been built in great numbers and developed to a point where they are capable of operating at high speeds over long distances, with large bombing loads, thrust upon the world a new concept of national defense."

The Committee attributed the fact that Germany and Italy have been able to gain so dominating a position not only to the fact that they have built up great air fleets, but even more to the fact that the airplanes composing those fleets are of superior military characteristics. This superiority, it was reported, is due to vastly increased research work.

"The history of 1938 bears witness as to how a nation in the space of a few years, by concentrating much of its scientific research and industrial resources on the development of air power, could gain, for the time being, a dominating position," the N.A.C.A. stated.

To combat the menace of foreign progress in airplane design, which was threatening to render this nation's air defenses obsolete, a thorough study of the entire field of aeronautical research was begun last year. Colonel Lindbergh was engaged in this work abroad.

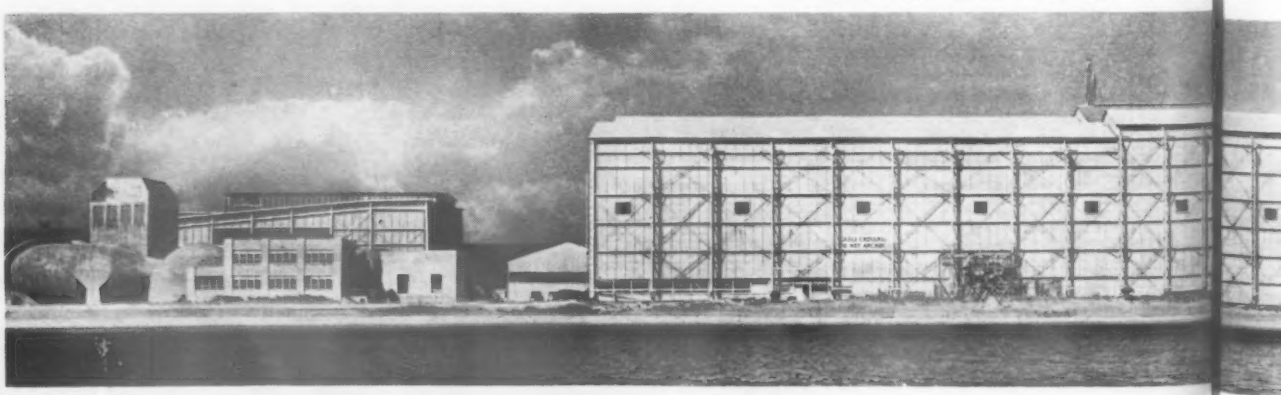
In the United States a committee headed by Maj.-Gen. Oscar Westover was at work. Less than a month prior to his death in an airplane crash in California last September, General Westover submitted a report to the N.A.C.A. asking that his committee be continued and that it be given the additional function of making a study of long-range planning for future research facilities, involving an additional research center away from the Langley Memorial Laboratories of the N.A.C.A. at Langley Field, Va.

General Westover felt strongly that the United States should not put "all its eggs in one basket" in the vitally important field of aeronautical research, upon which the nation's security would depend in time of war. His plan for a decentralization of the Federal Government's aeronautical research activities and for establishment of a second West Coast research base, according to his associates, stands as one of his last major contributions to national defense.

General Westover had gone just far enough with his preliminary studies to indicate that he favored a new N.A.C.A. station near the California airplane manufacturing center. In this work he had the support of the late Dr. Willis R. Gregg, chief of the Weather Bureau, a member of his three-man subcommittee. Dr. Gregg died within a few days of General Westover, leaving as the sole surviving member of the committee Rear Admiral Arthur B. Cook, chief of the Navy Bureau of Aeronautics.

Around Admiral Cook a new group, known as the Special Committee on Future Research Facilities, was assembled. It is composed of Maj.-Gen. Henry H. Arnold, who succeeded General Westover as chief of the Air Corps; Edward J. Noble, chairman of the Civil Aeronautics Authority; Edward P. Warner,

Below and on opposite page is the N.A.C.A. skyline today. Far left is 500 m.p.h. tunnel.



former Assistant Secretary of the Navy for Aeronautics and now technical adviser to the C.A.A.; and Dr. George W. Lewis.

The committee submitted a four point program calling for:

1. The construction of a second N.A.C.A. research station at Sunnyvale, Calif., involving the construction of the most advanced and necessary research facilities.

2. The construction of badly needed additional research facilities at Langley Field.

3. A new plan for the more effective coordination of applied aeronautical research in industry.

4. A plan for the stimulation and encouragement of aeronautical research in educational and scientific institutions in problems supplementary to the research programs of the Government.

"The Army and Navy are confronted with serious and pressing problems in connection with the technical development of aircraft," the committee stated in its report. "Other powers recently have developed aircraft of greater military effectiveness. This has been made possible largely by the tremendous expansion in aeronautical research facilities abroad. The efforts of the Army, the Navy and the aircraft industry in the United States to regain leadership in the technical development of aircraft are fundamentally dependent upon expansion of the research facilities of the National Advisory Committee for Aeronautics.

"In view of the critical condition of world affairs and the overshadowing influence of air power, it is of vital importance to our national defense to proceed with this program without delay, for on its execution will largely rest the hopes of America to excel or at least to keep pace with world powers in the technical development of aircraft."

President Roosevelt and the budget bureau have responded to the pleas for additional funds for aeronautical research in noteworthy manner. For the current fiscal year the N.A.C.A. received $1,760,000 in the Independent Offices appropriations bill.

For the coming fiscal year the Independent Offices bill, as reported to the House, carries $2,180,000, an increase of $420,000. On the same day, however, President Roosevelt transmitted to the House an extraordinary budget calling for immediate appropriation of $6,723,000 and authorizing the N.A.C.A. to enter into contracts not to exceed $6,000,000. This would provide a total of $15,003,000 for expenditure or contract during the coming fiscal year.

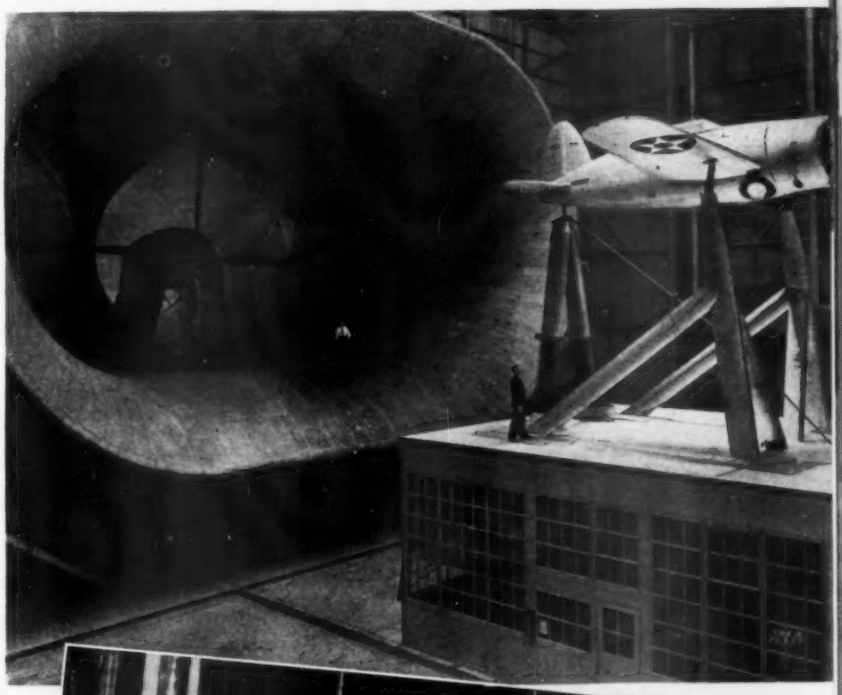
This vast increase, applied to expansion of facilities at Langley Field and to creation of the new research base at Sunnyvale, should do much to restore American leadership in the field of aeronautical research and should at the same time benefit domestic civil aviation as well as the cause of national defense, and lessen the danger of a crippling or complete wrecking of national research facilities in event of war.

An unwelcome accompaniment to the national defense program has been a growth in foreign espionage activities in the United States. Several cases have been "broken" by Federal agents and foreign spies have been arrested, tried and convicted. Much of the foreign spy work has been directed against American aircraft plants and military aviation activities.

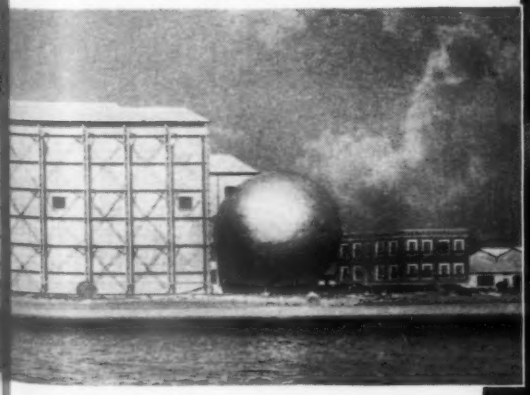
To overcome the menace of such espionage to American security, the Federal Government today is expanding its counter-espionage forces, especially in the Justice Department. As the American aeronautical research program goes into full swing, the importance of halting the work of foreign spies and preventing the leakage of military aviation secrets obviously will increase. It may be anticipated that foreign espionage activities will grow in about the same ratio as our

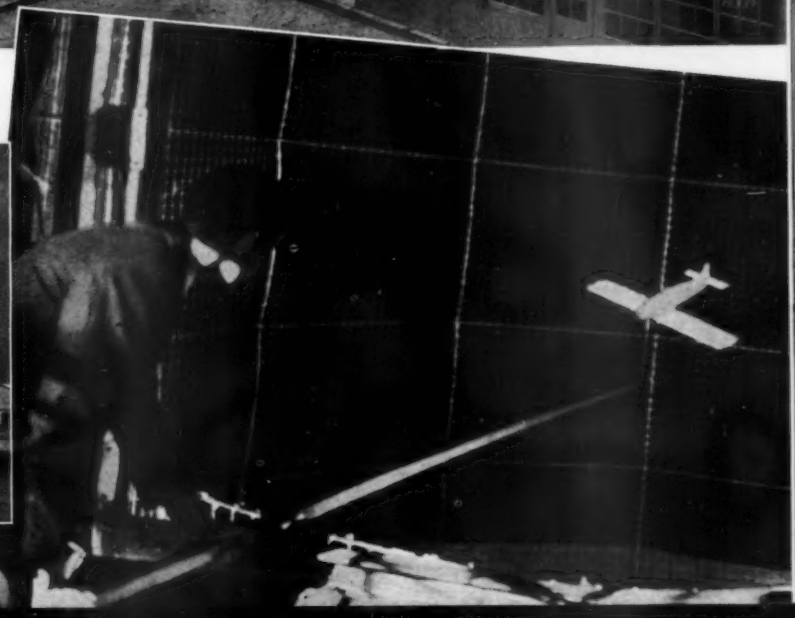
(*Continued on page* 82)

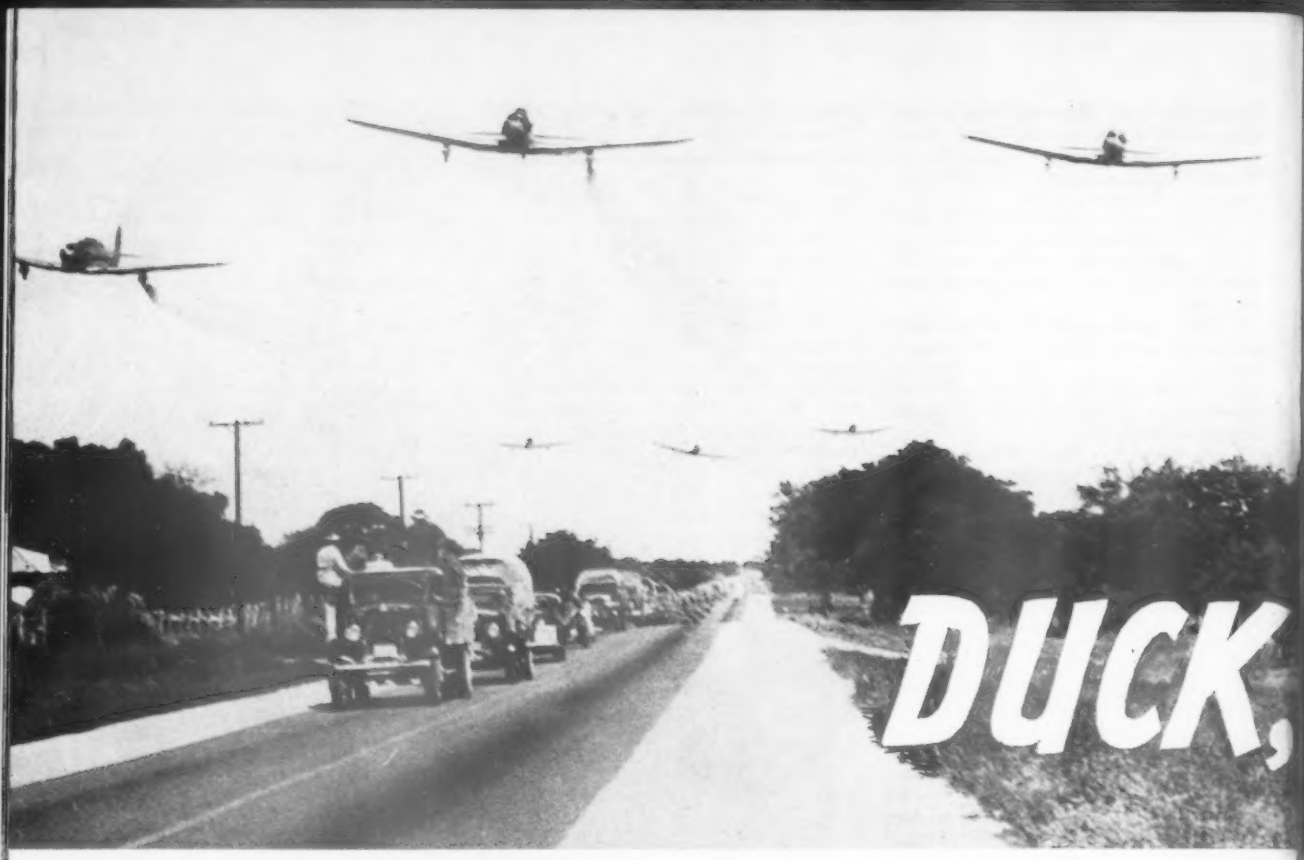
Directly below is the famous N.A.C.A. full-scale wind tunnel in which the completed airplane itself is mounted and tested. The ship in the picture is a Brewster XF2A-1.



The model at right is being lowered into the free-spinning wind tunnel for testing.







DUCK,

These attack ships are spraying paint instead of gas. Paint marks on men or trucks signify a "hit".

by
MAJOR ROLAND BIRNN

Opinions expressed herein are those of the author, not the War Department.

THE highway extends for miles, straight as a die, and those miles are filled with troops and vehicles on their way to the front. Foot troops, animal drawn carts and wagons, trucks—all in their respective places in the long line that moves slowly, packed on the long straight road. On one side is a lake, on the other a swamp, with steep banks alongside the knolls rising here and there along the way. Miles ahead there is a muttering and signs of smoke, the indications of war at a distance. And then, in 10 seconds time after the first warning sound, the active front is brought right down to these troops. Over a hill tears a section of three attack planes. As the men look back, some of them drop, mules and horses plunge and scream and a truck runs wild and plunges into the swamp. A hard, tacking rattle is heard until the planes, now overhead, release their small, parachuted bombs . . .

But why go on to describe the next few minutes when other planes have followed the first ones along this length of road? Writers of fact and fiction have already done so. They have used horrific adjectives freely: "holocaust," "demoralization," "mangled," "bursting death," "corrosive gases." It makes good reading—if you like that sort of stuff. It makes such effective reading that the layman is apt to believe that that is the sole mission of the attack plane, the attack of personnel on the ground; "ground straffing" to use a World War term.

It would save the designers of our attack planes lots of headaches if that's all the Air Corps wanted these planes to do. Range would be a minor item; the planes could base far to the rear but gas up at an advanced field close to the front, sally forth and go but 20 to 40 miles across the front, do their dirty work and return to their bases.

Designers, however, seldom get off that easy. Few of them ever do when they step out to satisfy the requirements of military aviation. In the case of attack airplanes, range is just one of the several items they must take into consideration. But let us foresee the possible missions attack aviation may be called upon to perform, first defining the Army Air Corps' meaning of the term.

Attack aviation is that class of striking force aviation that is organized, equipped and trained primarily to destroy light material objectives and personnel. Note those three requirements: *organized, equipped and trained.* During the World War, observation, pursuit and light bombardment aviation performed such missions. These missions were remarkably

Camouflage is being applied to all upper sections of this A-17A. The ship's bottom is painted dark, non-reflecting colors.

No flyer has a more death-defying job than an Army Air Corps attack pilot. He carries on a hedge-hopping war that would give any airman the jitters.

, SOLDIER!

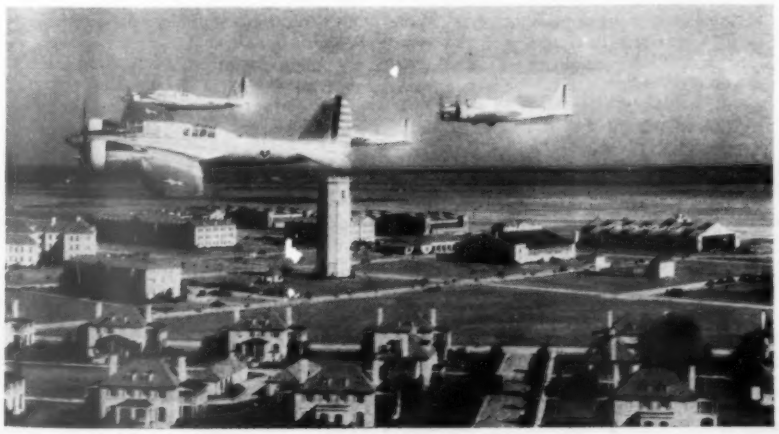
An attack pilot may be called on for any mission. This one is laying a smoke screen for those tanks.

effective, but it was easily seen that their more efficient performance demanded a class of aviation specially fitted for such missions. After the Armistice the United States Air Corps (then the Air Service) was about the first to develop attack aviation as such. This was rather paradoxical, because its use was contemplated primarily against *troops* on the ground, while the United States army, of all countries, was less liable to attack by enemy ground forces than that of almost any other power. However, the early development of attack aviation for this purpose gave excellent training to our own ground troops in defensive measures against such aviation. For every trick of the trade our attack aviation thought up and perfected, our ground commanders developed a counter agency. Score one for our attackers. Not only were they developing sound tactical principles for their own employment but they were also bringing the non-flying branches of the Army face to face with the facts of life regarding possible warfare in the future, for the non-flyers lost little time in equipping and training themselves to cope with such air threat.

Meanwhile our bombardment aviation was going along, paralleled by the antiaircraft artillery, until one day it dawned upon them that it would be mighty convenient, when attacking an objective well defended by antiaircraft of artillery, to have the support of attack aviation to tear in and break up such artillery defenses and so leave the field clear for the bombers. From then on, one possible mission after another was wished on attack aviation—and with each such mission the designers' worries increased.

Naval vessels bristled out with antiaircraft artillery, so attack aviation was charged with the mission of neutralizing antiaircraft defenses at sea as well as on land, in support of friendly air operations. This mythical enemy navy got closer to our shores and the transports it was convoying sent landing parties ashore, so attack aviation's missions included the attack of light vessels and personnel in coast defense operations. Counter air force operations became primarily the attack of aircraft and air installations *on the ground*, where they could be found and were more vulnerable, rather than the attack by pursuit aviation and antiaircraft guns of enemy aircraft in the air where they, the attacked planes, could defend themselves or more easily elude detection.

And so we have the present concept of attack aviation. The desirable characteristics for the airplane to do the job are several. High speed, obviously, is of the utmost importance as it increases the chance of surprise, adds to the mobility and shortens the time of the



Latest model attack ships in the Air Corps are the Curtiss A-18's (left). Here the pilot has a tricky twin-engined ship to handle too.

The surprise attack of low-flying high speed airplanes is terrifying and demoralizing to groundmen.

airplane's exposure to enemy and ground attacks. As the attack plane flies low, for reasons we shall see later, it should be extremely maneuverable. Quick turns close to the ground are necessary in the employment of attack aviation. During the low approach to the target and the assault itself it is necessary to have sufficient maneuverability to place the airplane directly over the target during the last few seconds of flight. Range is determined by the location of the targets against which it will operate, targets such as hostile air base installations and airdromes, landing parties on friendly shores, supply and manufacturing establishments, principal roads, railroads and bridges, and concentrated bodies of troops and, to be more inclusive, just about every target against which bombardment aviation may operate and for which mission it will need attack aviation's support. Field of vision to the front and flanks is important to the pilot. He must have a minimum of blind space ahead of him so that he can see the target at all times during the approach to it and during the attack. Of course, with an engine in front of the pilot, this characteristic is not always possible of attainment. If there is a rear gunner he needs vision and a field of fire to the rear to allow him to defend his airplane efficiently from hostile air attacks. As the attack airplane will operate under rifle and machine gun fire it should have as much invulnerability as possible to the effects of such fire, not to mention occasional fragments of its own bombs. Armor for personnel and vital points and parts of the airplane is one means of effecting invulnerability. How effective different types of armor really is against various calibre bullets is rather confidential; suffice to say that investigation and experimentation never dies. Leakproof and detachable gas tanks were developed a number of years ago and do much to increase invulnerability, as does the air-cooled engine as opposed to the liquid-cooled affair.

The above are not the only desirable characteristics. Enough stability to allow the pilot to fly with hands off the controls if necessary would be a boon to the pilot, who operates the forward machine guns, drops the bombs, operates the chemical release mechanism and also trims the horizontal stabilizer as the various loads leave the airplane. Rate of climb is not important, but the airplane although normally flying very low on its missions must have enough ceiling to enable it to clear the highest mountain ranges in this country. As some of the airplane's work will be at night it should have as low a landing speed as possible and all other characteristics desirable for night flying. Noiseless flight will never be entirely possible, but here the designers have done a remarkable job and the noiseless characteristic of our modern attack airplane is uncanny; enabling it to sneak up on its target with a minimum chance of detection.

The present attack airplanes in use by our GHQ Air Force are the Northrop A-17 and A-17A and the Curtiss A-18. The Northrop is equipped with a two-row radial engine of 750 h.p., flaps and adjustable propeller. The A-17A has retractable landing gear. The A-17 carries 338 gallons of gasoline. The Curtiss job has two engines with a long slim fuselage between them and is much faster than the single-engined type. Of the attack units in the Air Corps, the third Group with the 8th, 13th and 90th squadrons is stationed at Barksdale Field, La.; the 17th Group with the 34th, 73rd and 95th squadrons is at March Field, California; while the 26th Attack squadron is in Hawaii and the 74th Attack squadron is at Albrook Field on the Pacific side of the Panama Republic.

So much for the machine, the missions and the attack units in our air force. So much also, for the problems of the designers and other engineers, not forgetting the problems of the group and squadron commanders in training their units and combat personnel to efficiently perform any or all of such varigated missions. Let us see how the attacker does his work, foregoing the temptation while we're doing it of using the aforementioned horrific adjectives.

Why, for instance, does the attack pilot fly low? What happens when he jumps on that long straight road full of marching troops? What happens to the troops and to the pilot? How do the ground troops avoid attack from the air and, if they cannot avoid it, how do they fight back?

A look at Figure 1 shows the disadvantage at which the troops would be placed. No place to dive for cover. A long straight road offering an excellent field of fire for the machine guns of the attacking aircraft. The whole set-up popularly known as an attack pilot's, or aviator's dream. But then look at Figure 2. If the ground commander *must* use that long straight highway in the face of the hostile air threat he need not let it go undefended. On the very hill that the attack pilots will use, or *might* use, for cover on the approach this ground commander posts observers and machine gun detachments, hoping to shoot down the hostile airplanes as they approach and in case they don't play ball but approach from the unexpected left (of Figure 2), he posts a few observers and guns on all other overlooking hills. No one is so foolish as to believe these machine gunners can down all oncoming aircraft, although remarkable progress is being made in our army's infantry in marksmanship against low-flying aircraft. Nor will any think-

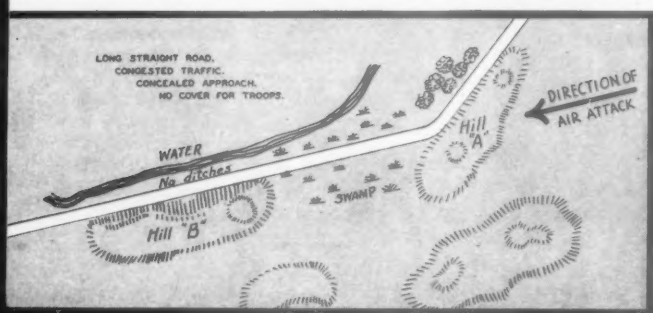


FIGURE 1. The layout below is an attack pilot's dream of an ideal target. There are many places to "hide".

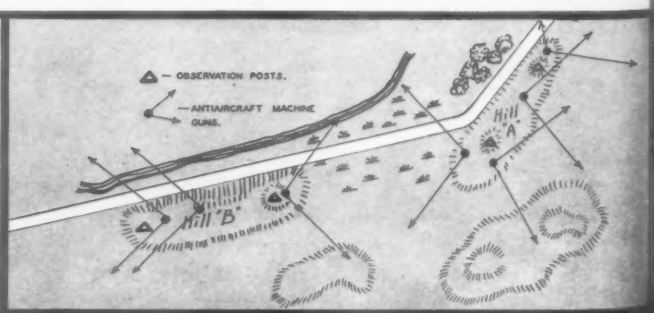


FIGURE 2. But ground troops have learned how to fight the attack pilot. They have plans for halting that pilot's dream.

This squadron of Curtiss A-12's is flying high by comparison to ordinary attack-plane altitudes.

ing airman claim that all attacking planes will return unscathed from such a mission. The complete picture of warfare, however, should take into consideration the delay to which an air attack *or the threat of air attack* subjects the enemy ground troops. Passive means of defense are far better than active means; in other words it is far more effective for the ground troops to use other than those routes which are easily attacked from the air. Far better that they should march at night and along crooked byways, if possible; or that they should scatter out and seek the cover of woods in their bivouacs. Such night marches, however, progress more slowly and are more tiring to troops than daylight marches along good roads. Scattering troops in woods adds to the commander's difficulties in controlling such troops. Air attack or its threat subjects the ground commander to a brand new set of problems.

What would you do, for instance, in moving a truck column from "Start" to "Finish" in Figure 3? If you moved your trucks by daylight along the straight road you could do so in three or four hours. Your time of exposure to air attack would be lessened but an air attack during that time would be tragedy. If you moved them at night, the attackers would be less likely to find you and their gunnery and bombing accuracy would be lessened—but friendly pursuit aviation could not protect you. Don't be too hasty and go to the extreme of moving along the dirt roads at night. Their longer route and your lessened speed might result in your inability to complete the truck movement by darkness.

Once the truck column, or those marching doughboys of Figure 1 fame reach the front lines or come within enemy artillery range, they are safe from air attack according to our army's concepts of attack aviation employment. For, effective as attack aviation may be, there can never be sufficient of it to warrant its indiscriminate use when some other and less scarce, agency such as artillery can do the job about as effectively. In all ground situations there are vital targets beyond the reach of artillery which can be powerfully dealt with by attack aviation.

If passive means, such as dispersion and concealment, are rather effective against attack aviation, such passive means cannot be carried on indefinitely. Eventually troops must move in the open and in large bodies, and vital targets cannot always remain camouflaged. Therefore the attack plane must be so employed that it can hit the target in a sudden surprise attack.

Turn to Figure 4. The pilot flying just over the tree-tops uses the unevenness of the ground and trees for concealment in his approach. The noiseless-flight characteristic also helps in the surprise attack. Bursting upon the troops, or any other objective, he fires the forward machine guns when within sufficient range to beat down armed resistance. Here low-flying makes for more effective grazing fire as can be seen from the diagram. As he passes over his target or the length of the road assigned him, the pilot drops small fragmentation bombs. Were these bombs dropped free, the pilot would probably never return home, but would end up in flames on the roadside, a victim of fragments from his own bombs. Such bombs, however, have small parachutes attached which delay their fall sufficiently for the airplane to be outside the danger zone when they hit. As can be seen from the diagram, low flying allows greater bombing accuracy where sights cannot be used and makes detection by enemy pursuit aviation much more difficult. Hedge-hopping is no fun at night as can be well imagined and, although attack aviation will be used at night, it is not as effective as in the daytime. The thought occurs that neither will returned fire from the ground be as effective at night as in the daytime.

Besides machine guns and small bombs, chemicals may be employed by attack aviation. Although not as destructive as bombs or machine gun bullets, chemicals can cause more delay to the enemy. Decontamination of an airdrome or a body of men takes considerable time and, if delay is desired, chemicals may be extensively employed. Gas proof tarpaulins, however, can always be used to cover dumps of supplies or airplanes staked out on an airdrome. A favorite trick of attacksters is to drop bombs and also some chemicals to slow up the work of repair of a bridge, airdrome or hangar.

There are many, many more tricks in the bag of the attack pilot. Although the newest branch of military aviation, attack might also be considered among the deadliest.

Air Corps officers lately have seen fit to adopt twin-engined equipment for attack squadrons. Pilots have expressed varied opinions on this change, their biggest objections being to the added engine which makes such fast, low-flying airplanes an even trickier steed to handle. At present, the Air Corps has several Curtiss A-18's for their twin-engined experimentation.

Attack pilots are selected at Randolph and Kelly Fields in the same manner as other Army airmen. They currently are trained on old A-17's. Most squadrons are equipped with A-17A's and A-18's . . .

Clever fellows, these attacksters. Theirs is a dangerous job, even in peacetime practice. One wonders why they *do* wear parachutes.

END

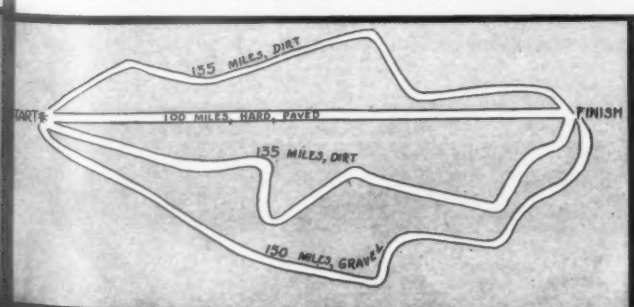


FIGURE 3. Considering the possible presence of attack ships, what route below would you take? Each route has its dangers.

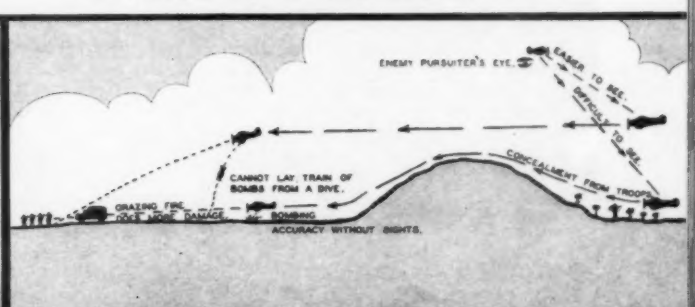


FIGURE 4. Here is why the attack pilot flies so low. His machine guns do greater damage with grazing fire.

IRON MIKE

Most prominent feature on the instrument panel of the new "Yankee Clipper" above is the important gyropilot, Iron Mike.

by DONALD FROST

He's speechless, metal and dumb—but to the airline pilot Iron Mike's a godsend

Mike is a combination of gyrocompass (left panel) and gyro-horizon (right panel). Any ship can be flown simply by adjusting the knobs.

DUNCAN McCALLUM, who has a burr in his speech and a pair of eyebrows with a built-in cowlick, lounged back in the captain's seat of a Douglas DC-3 which squatted on the concrete floor of a Newark airline hangar.

"He never says anything," he remarked with that sly, slow, Scottish smile of his, "but he is nice to have around. Fact is, I couldn't get along without him."

McCallum was giving me a kindergarten lesson on how to pilot an airliner. He had taken me through the intricacies of using the artificial horizon in thick weather, of manipulating the mixture controls when the engine head temperatures went up, and of orientation problems in the teeth of a 40-mile quartering wind.

But now this Scot was getting into Greek, and I shook my head in token of my ignorance.

"He?" I said. "Who's he?"

"That's Mike," he replied. "Mike is Pilot No. 3."

If a man can love something inanimate, as he loves his home or a favorite pipe, a pilot develops a genuine affection for that strange, mechanical contraption which is Mike, the gyropilot. Mike gives a pilot two extra hands. Mike means added safety. Mike is an epitome of everything that is meant when engineers talk of automatic flight. Mike's warm eye looks out from the instrument board in reassuring fashion when the wing tips dissolve in mist and eardrums begin hurting from the incessant crackle of static.

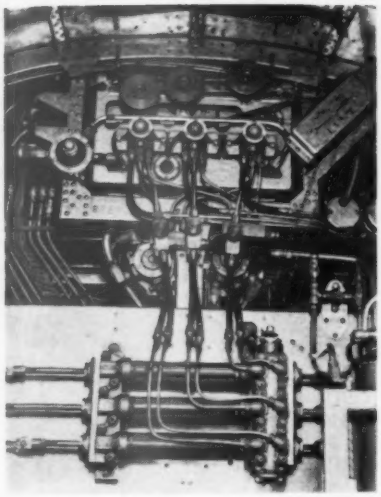
Yes, if anything contrived of metal by aviation's artisans can take on personality, Mike—to the men in the cockpit—is human. We don't hear much about Mike except in an offhand fashion.

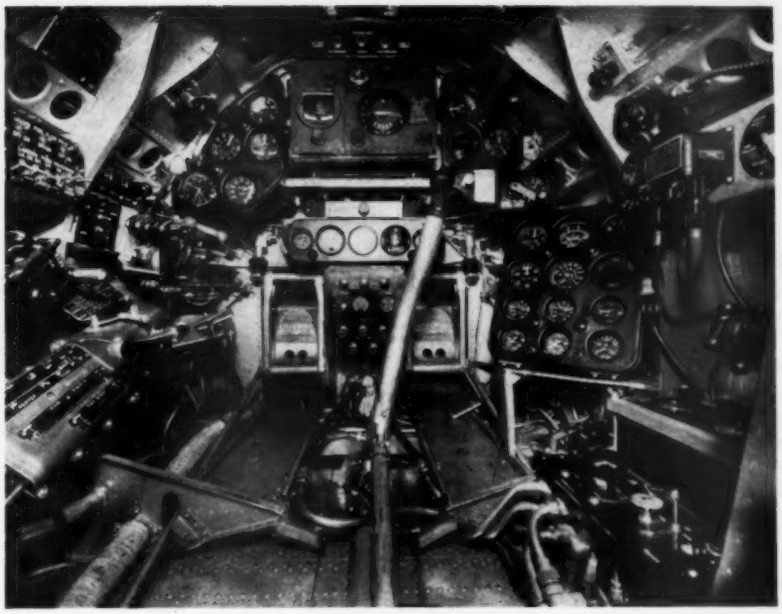
"I was on the automatic pilot," the captain of an airliner will say, "from the time I made altitude and got on course at Newark until I picked up the field at Chicago."

Or the skipper of a trans-oceanic flying boat, in a hangar session, will remark, "It was rough for 300 miles, but the gyro helped smooth it out."

Or Duncan McCallum, gazing from beneath those remarkably wind-blown eyebrows of his, will say, "I can overcontrol him if I pull hard, but it takes a lot of muscle."

Just who is this fellow they talk about? Where was he born? How does he work? How many twin brothers does





The maze of tubes and valves above is merely one gyropilot seen from the rear. Iron Mike can be seen perched at the top center of the Seversky cockpit at right.

he have racing over thousands of miles of airways throughout the world?

Well, we'll start at the Brooklyn end of that big bridge which the city slickers have been selling to New York visitors for these many years past. When you have crossed Brooklyn Bridge, which spans New York city's oily East River, you are square in the center of Bridge Plaza, which is about one-tenth as imposing as it sounds. Wisecrackers who live on that island known as Manhattan are fond of saying that the only things to be found in Brooklyn are fogs and ship rats, but then they have never heard of the Sperry Gyroscope Company.

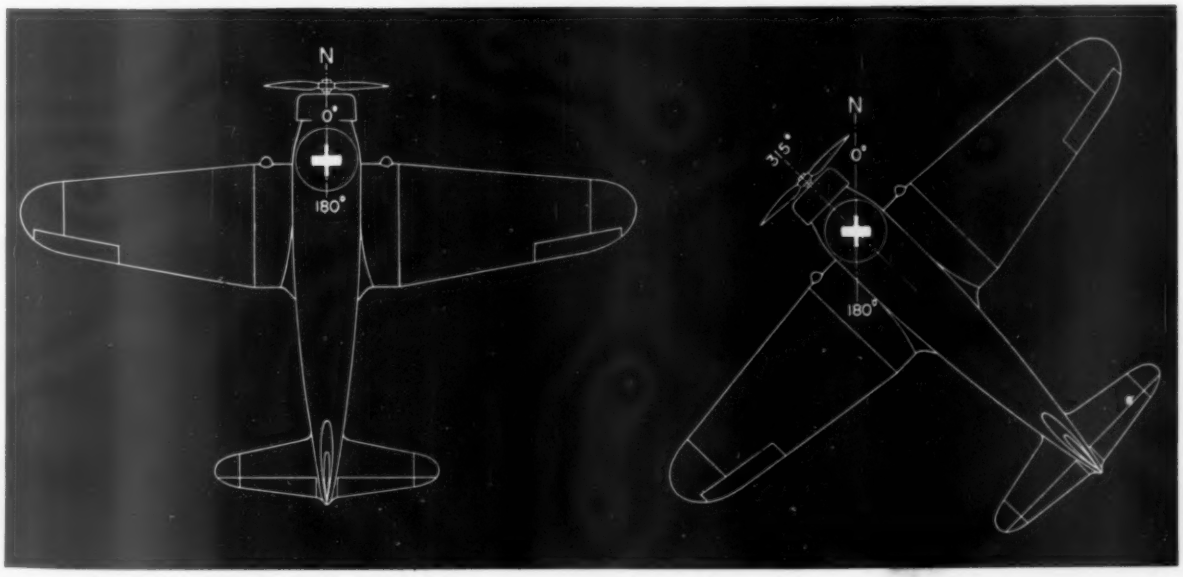
On a clear day a visitor can stand on the 11th floor of the Sperry building hard by Bridge Plaza and count the windows in some of Manhattan's skyscrapers, shooting up pencil-like against the sky. And beyond those buildings lie blocks of docks where big ocean liners nuzzle in against their piers in the Hudson.

Occasionally an airliner soars overhead. That airliner and many of those ocean liners carry Sperry equipment. The surface ships contain gyro-stabilizers, gyro-compasses and gyro-pilots. The airliner is equipped with a gyro-horizon and the directional gyro which, in combination, is—you guessed it—none other than Iron Mike.

Mike is made right here in this 11-story building. Two thousand employes, several hundred of whom have a hand in creating Mike, make up the Sperry family. Mike undergoes 1,400 machine operations before he is ready for the assembly line. Then he is subjected to 300 assembly operations before he emerges as Pilot No. 3 for World Aviation. That is a lot of work on a little fellow who weighs, complete, only 60 pounds.

Mike's birth is a signal for the Strong Arm Squad to go to work. The Strong Arm Squad simulates flight conditions—and worse—for a week, giving Mike the works, before he is permitted to leave the factory. Mike goes into an ice box with a reading of 30 degrees Centigrade to see if he can "take it" at low temperatures. He is put into a device called an oscillator, which looks like a landlubber's nightmare of a storm at sea, just to prove whether he can keep his head with

The directional gyro is part of Mike's brain. The position of the gyro when a plane turns off course is shown below. The gyroscope maintains a constant heading no matter what direction the plane turns.



Pan American's transpacific clipper pilots rely a great deal on Iron Mike for assistance. A large part of these long tedious flights actually is done by the gyropilot.

the world down around his ears. After that he is ready for service.

To strike up an initial acquaintance with Mike, let's spin an ordinary schoolboy's top on the floor. As long as the top retains momentum, its axis of rotation remains at right angles to the pull of gravity. The power that keeps the top whirling is the very essence of gyro operation.

Give the top a universal axis, permitting it to spin in any given position, and you have a gyroscope. A gyroscope resists any effort to move it out of the position it is in when it starts rotating.

That is Mike's secret of success. Of course, it isn't as simple as all that. He has what the Sperry people, with an understanding of that affection which pilots bestow upon him, call a brain, a nervous system and a set of muscles. And we may as well make it plain in passing that Mike has a one-track mind. An airplane pilot may go to pieces in the face of sudden emergency, but Mike labors on with all the single-mindedness of a gorilla on the hunt for food.

The two wheels which spin so tirelessly in the directional gyro and the gyro-horizon are Mike's brain. Air relays and oil valves are Mike's nervous system. Hydraulic cylinders with pistons which actuate an aiplane's ailerons, rudder and elevators are Mike's muscles.

If Mike has a one-track mind, he certainly does his job with more finesse and with a finer touch than the human hand. How he does it is as fascinating a story as the operation of one of those business calculating machines which does everything but reduce the rent.

First, the directional gyro—half of Mike—is a free gyroscope. That is, it moves feely around three axes. The human pilot can set it to the same course as the magnetic compass. This gyro rotates around a horizontal axle. If the course is altered, the gyro maintains its position, and the pilot can tell how many degrees he has turned by checking against a compass card mounted in the face of the gyro.

Next comes the gyro-horizon. This gyro rotates around a vertical axle. It can be used safely as a reference for longitudinal and lateral control. The gyro-horizon indicates the movement of a plane in a glide or turn.

Now we have Mike's brains. Set him on a course, and he will stay there through a Chilean earthquake or a Senate debate. Air "pick-offs" form the first stage of Mike's nerve system. The pick-offs (there are three sets of them, two connected with the gyro-horizon for lateral and longitudinal control and one with the directional gyro for compass control) consist of discs with knife edges which intercept the flow of air through ports.

Getting complicated? All right, keep the horizon on your nose and your stick neutral for just a minute because we are getting through the worst of it. As long as the airplane is in level flight, the air from the pick-offs flows normally through equalizing ports, but the moment it banks, climbs or dives, a port is closed.

That increases the pressure against a diaphragm in Mike and actuates an oil valve which transmits oil to a piston. That piston—Mike's muscle—moves the ailerons, rudder or elevators to bring the plane back to normal flight.

Mike essentially is just that. There is more to him, of course. In controlling a plane, it is not only necessary to apply control to bring the plane back to level but also to remove the applied control so the control surface will be back in neutral when the disturbance has been corrected. Sperry calls that easing-off of the controls Mike's follow-up system.

Transport pilots often use Mike *85 per cent* of the time they are in the air. Wiley Post used him constantly on his solo trip around the world in 1933. Two dozen major airlines throughout the world maintain their schedules with Mike's assistance. On flights across the Pacific and, on all the transatlantic survey hops, Mike was at the controls.

Mike was in there pitching on the Army Air Corps' mass flight to Buenos Aires a year ago, on the Navy's mass flights to Hawaii and the Panama Canal Zone, and on Howard Hughes' spectacular 'round-the-world trip last July.

In bad weather the safety of the airplane and its passengers and crew depends upon the human beings in the cockpit. On long flights human pilots are often fatigued from the strain of keeping a ship on course. Mike permits the men up front to devote their entire attention to mechanical and navigational problems, radio and engine control. Mike contributes to the comfort of flying not only forward but aft.

"You are on the gyro, aren't you?" Jim Webb, of the Sperry Company, asked a TWA captain this winter during a pretty rough trip between Columbus and St. Louis.

The skipper nodded.

"I could tell," said Webb. "He smooths out the bumps."

Mike's history started back in 1909 when Sperry installed a "stabilizer" in Stanley Y. Beach's monoplane. It was Mike in a rudimentary form. In 1914 the late Lawrence Sperry was awarded a prize for the stabilizer.

The war, with its demands for high speeds and maneuverability, kept Mike in short pants. Not until the 1920's were Mike's integral parts given serious study as a means to instrument flying. In 1929 Jimmy Doolittle took off, flew and landed in a Guggenheim Foundation demonstration with the cockpit completely covered. He used Mike's gyro-horizon and directional gyro.

The birth of Mike, with his brain, nerves and muscle, was the next logical step. Today Mike has more than a thousand brothers operating throughout the world. In dismembered form, Mike has 20,000 horizons and directional gyros in use. The things which go into the making of Mike are durable. Sperry's records show that one gyro-compass was operated at a rotor speed of 6,000 r. p. m. for 13 months without stopping.

How is Mike used? As soon as a plane is clear of a port and on course, the skipper rotates adjusting knobs on Mike's control unit so that three follow-up indicators match the gyro indications for direction, bank and climb. Then he moves the engaging lever to "on" and let's Mike take over. The climb knob is adjusted to obtain the desired rate of climb. At cruising altitude another slight turn of the knob puts the plane in level flight.

For a change of course, the desired angle of bank is set in. and the turn

(*Continued on page* 79)

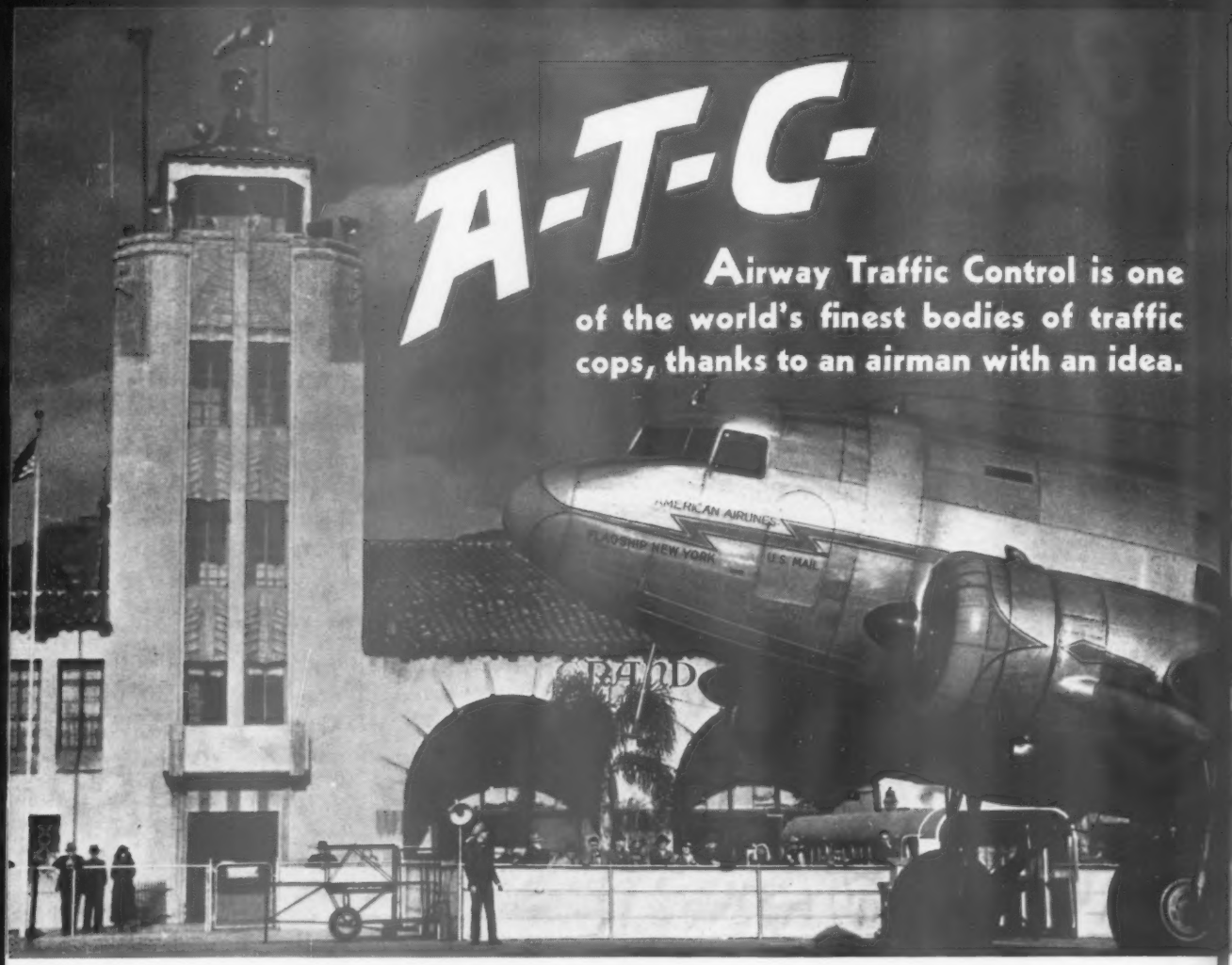
PREVIEW OF THE ARMY'S NEW

MARTIN ATTACK-BOMBER

THE exceptionally clean-looking monoplane you see here is the work of Glenn L. Martin's factory. By the time you read this, some decision should have been made by Wright Field officials as to the ship's acceptability to the Army. The new Martin is powered with 1,200 h.p. engines, has hydromatic propellers and carries a crew of three. Top speed is said to be 350; gun turrets are easily seen. There isn't a single wire or brace to mar the ship's streamlining; rumors say its drag coefficient is closer to two than the Bell *Airacuda*.

A-T-C-

Airway Traffic Control is one of the world's finest bodies of traffic cops, thanks to an airman with an idea.



Airway Traffic Control at Glendale, Cal., is perched high in the administration building tower above.

by DICK KIRSCHBAUM

NOT so long ago the writer was a passenger aboard an airline transport, flying to Newark from Cleveland. The weather was a bit soupy and we were flying on top the stuff. According to our watches, we should have been on the ground at Newark about 20 minutes ago. But we were going around in circles.

A crotchety old man in the adjoining seat kept mumbling to himself about appointments. He was going to be late, he said to all who cared to listen. He looked out the window and saw banks of clouds under him. He was getting madder by the minute.

"There's no blankety-blank reason for this," he fumed. "If I wanted a nice slow trip I'd have come by train. We should be in by now. Why the blankety-blank-blank don't we land!"

The stewardess tried to calm him, but he wouldn't listen. Just then we flew over a hole in the clouds. As we flitted over it, we saw another airplane between us and the cloud below us. The stewardess pointed it out.

"Would you rather we take a chance on crashing into another ship on the level below?" she asked. "You know, we're not the only ship circling the airport, waiting for an okay to come in."

"What do you mean, okay to come in?" asked the old crab, half-way interested. "Who gives you the okay and what's it all about?"

Which brings us into the point of our story.

Three years ago the old gentleman would have had a real reason to crab. He wouldn't have been flying at all in such weather because flights would have been grounded at their point of origin. At that time most planes and pilots flew "contact", or visual flying. It was the transition from this contact to complete instrument flight which made the lads-who-give-the-okay a necessity—and also the reason for the plane circling in an apparently aimless manner over the airport.

Airways Traffic Control, now a regularly constituted section of the Civil Aeronautics Authority, is one of the newest and most important contributions to safety in air. Its establishment has not been an easy job. The writer, by chance, was in practically at the birth of this new department. It started as a vague idea in the mind of Earl F. Ward, at that time a vice president of American Airlines.

Earl, a practical airman himself, had plenty of vision. He saw, through glasses focused on the future of aviation, that contact flying was going out. New developments in radio and other instruments, he rightly conjectured, would make it possible for the airline pilot to operate his plane through heavy clouds where there was no visibility. Scheduled airline traffic was growing in leaps and bounds. Ward feared crashes in mid-air between planes depending wholly on their instruments. He tried to dope out a system which paralleled the railroad's block system so that planes could be controlled from the ground by an agency which kept a tight check on all planes coming in or going out.

Ward took his idea to Lieutenant Dick Aldworth, superintendent of Newark airport, and asked for space in the administration building to work out his plan. Together he, Aldworth and Ponton ("Bon-Bon") d'Arcy, veteran pilot, built

On the desk-map before him, the ATC operator has movable blocks representing ships in his area.

a huge map of the United States, wired it, spotted it with little lights and other gadgets, marked out the airways and experimented.

The airlines took notice. They combined and pooled resources for Ward and his cohorts to work out a plan. Ward resigned his job with American Airlines to devote all his time to his baby. Hours meant nothing to Ward. He worked day and night on his plan and eventually evolved a system which worked out fairly well. A tiny room in the administration building was assigned him and the first Airway Traffic Control station was born. This was in 1935.

Because the airlines were behind it, they assigned men to assist Ward and to learn the business of regulating air traffic. The first men were not all pilots. Traffic men, radio men and dispatchers tried out. Some of them made the grade, others flunked.

Some of the old-timers objected to this absolute control. Arguments against its practicability arose but Ward, confident his idea was a good one, kept plugging.

In spite of these objections, Ward plodded on. Because the little cubbyhole of an office was sponsored by the airlines,

Earl F. Ward conceived the idea behind Airway Traffic Control and subsequently put it into practice. He was an airline vice-president at the time, now heads entire ATC.

their pilots were compelled to follow orders. They were instructed to observe the "westward-even" and "eastward-odd" altitudes, but this alone was not enough. Through their company ground stations their positions were relayed to Ward's little tower and instructions sent back to the pilots via company radio. The ATC never was and is not now in actual contact with the ship itself.

By this time (early 1936) Ward had trained enough men to start a second station at Chicago. Ships were routed from that point to Newark and were compelled to stay at the altitudes and routes directed.

The expense of maintaining this bureau still rested with the airlines. Ward felt it was important enough to be official and spoke to the Secretary of Commerce in Washington. After the usual red tape the air cleared and Airway Traffic Control became a part of the Bureau of Air Commerce, with Ward as its chief.

It soon was pointed out that this bureau, in congested traffic areas, had become a necessity for safety in flight because of the vast increase of air traffic under conditions of reduced or no visibility where protection from collision must come from without the ship. In other words, through ground control. Most of Ward's operators now were men with airline experience, either pilots or dispatchers, men who could put themselves in the position of the man aloft and think with him.

The Bureau of Air Commerce, by direction of the Secretary of Commerce, acquired experimental airway traffic control stations previously established by the scheduled airlines at Newark, Cleveland and Chicago. In July, 1936, similar stations were equipped and started at Pittsburgh, Detroit, Washington, Los Angeles and Oakland. These stations originally operated during periods of greatest traffic density, generally from early morning until about midnight. These stations, it is admitted now even by most of the diehards, have increased the protection and efficiency of operation of scheduled as well as private and public aircraft. And, at the larger airports such as Newark, Chicago and other points, men are on duty 24 hours of the day.

Getting back to the early days, the success of these frankly experimental control units, even with the limited means of communication, was such as to create an immediate demand from the flying public for an expansion of the system to afford greater protection at all danger points.

There now are approximately 11 additional fulltime or "primary" stations, operating 24 hours, with continuous service at all points within their control areas, in order to have uninterrupted protection in the more congested areas.

At some of the less congested areas continuous airway personnel is not required, yet there are periods of dangerous congestion. At these points, the services of communications personnel in handling traffic control during generally quiet hours is supplemented by trained men during those periods when traffic is heaviest.

"The need for complete airway traffic control coverage," Ward said, "can best be demonstrated by the fact that at least two major airlines are already planning one-stop straight-line flights, coast to coast, and the Army frequently makes nonstop straight-line flights from March Field, California, to Langley Field, Va. The attendant problem of fitting these flights into the many local traffic patterns through which they must pass demands a complete control system as nonstop flights, commercial or military, are now possible between almost any two points in the United States. Too much stress cannot be attached to its importance as a vital factor in safety."

". . . Nice eye there, Gates!"

Another important function of the ATC teletype network, which connects with all sections of the CAA, Weather Bureau and airlines, are requests and authorizations for shutting down radio aids to navigation for periods of routine inspection, repair and servicing to forestall equipment failure. These periods run for some 15 minutes daily and, one day each month, are off for eight consecutive hours. Aircraft may be flying one radio range course and using a cross leg of another radio range station for position fixing. The communications at the other station, possibly 150 miles away, cannot know when aircraft are determining their positions by using their facilities when that plane may be many miles away and following different airways from which the range is located. The necessity for approval from the ATC before "letting down" is obvious.

Direct telephone systems are maintained between the Airways Traffic Control and each airline ground station, in addition to one which connects with the airport traffic control tower. Every conversation held by ATC operators over these systems is automatically recorded on wax cylinders, similar to those used by the ordinary office dictaphone. These are listed and filed for reference so that there never can be an argument as to the instructions given and received. That is another of Ward's efficiency methods. He believes in keeping a verbal or written record of every transaction in which the control figures.

Due to his knowledge of all aircraft movements in a given area, an airway control station operator is in a position to determine the necessity for continuous service of any of the given radio aids for navigation in its control area at any time. His is an important trust.

At the present writing there are some 95 men employed by the Airway Traffic Control system in various parts of the country. Of these it is safe to say 60 per cent are men who have been pilots. The others have held or still hold private licenses and are experienced in radio meteorology or dispatching.

Of the 11 Airway Traffic Control centers operating at major airports in the United States nine managers are members of the original group which trained in that cubby-hole at Newark Airport.

Ward himself is chief, assisted by Glen A. Gilbert and John Huber. At Oakland we meet "Bon-Bon" d'Arcy; at Pittsburgh the head man is H. H. MacFarlane. Rod Sturtevant, former United Air Lines pilot, holds the reins at Burbank and Homer Cole is the boss at Cleveland. At Newark Emerson R. Mehrling, pioneer aircraft radio expert, is in charge; Bob Eccles swings the whip at Chicago; C. J. Stock at St. Louis; Ted Westlake at Salt Lake City and H. R. Copeland at Detroit. The other two who trained at Chicago are L. E. Warren, chief at Washington, and C. T. Talpo, in charge at Fort Worth. New stations are being considered and it is not improbable that new points will be operating before this opus reaches your hand.

Recently—as a matter of fact, just about a month ago—there were 11 passenger planes milling about in the soup over Newark. They were piled up 11 high, each one a thousand feet above the other. Each was assigned its altitude by Airways Traffic Control and told to hold to it until notified it was their turn to come in. The ships were spaced at approximately 15 minute intervals, alternating with departing planes.

As each ship was given its okay to

(*Continued on page* 80)

WPA labor constructed this hangar at Bryce Canyon, Utah. It was designed by the CAA.

WOODEN HANGARS ARE THRIFTY

by KURT RAND

It's not as much of a task or expense to have your own hangar. Lumber manufacturers have many plans whereby wooden hangars can be built inexpensively.

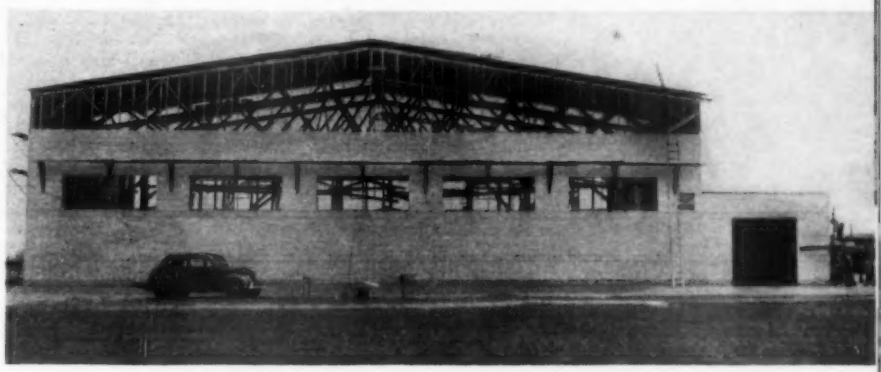
NEW discoveries in one field will often exert a strong influence in another, apparently unrelated. This statement is seemingly true in connection with the lumber and aviation industries, the former having developed a method of framing structural timbers that promises to make ownership of an airplane easier, or at least more economical.

A majority of those flying their own planes for pleasure often have occasion to remark: "It isn't the initial cost; it's the upkeep." And progress which makes it possible to house a plane for $10 a month instead of $15, is good news indeed. Research by the lumber industry into hangar construction has shown actual possibilities of reducing this "garaging" cost.

Hangars require wide openings, which call for clear span trusses. For many years structural timber, originally the only material for roof trusses, has been largely superseded by other structural materials. Recently, however, due to improved methods of joining timbers lumber is resuming its place in roof truss framing as well as for other purposes in construction, and on many fields in the recent years all-wood hangars are giving excellent service at minimum costs.

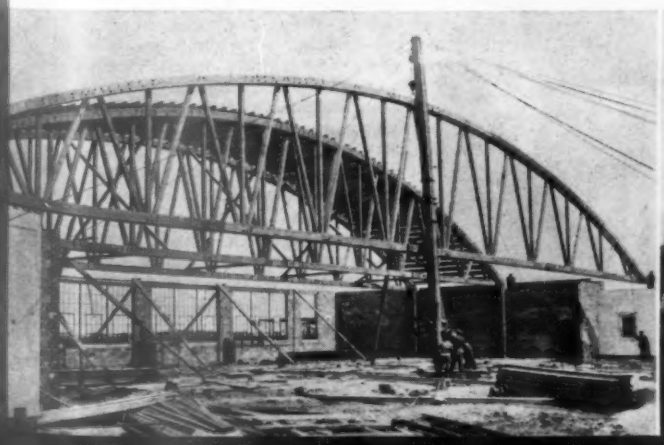
Using old-style solid timber trusses with notched and bolted connections, it was possible to utilize only about half the strength of the timbers. Insertion of special devices called timber connectors between the contact surfaces of the truss members increases joint strength and structural efficiency of this familiar material from 75 to 100 per cent, and also results in a lighter and more economical wood truss.

Hangar buildings using the new construction are quite well distributed, ranging from Bar Harbor, Me., to Monterey, Cal., and from DeLand, Fla., to Spokane, Wash. Widths of hangars vary, but generally are 60, 80 or 100 feet; and one hangar built with timber connectors at Wilmington, Del., has a 150-foot clear span.

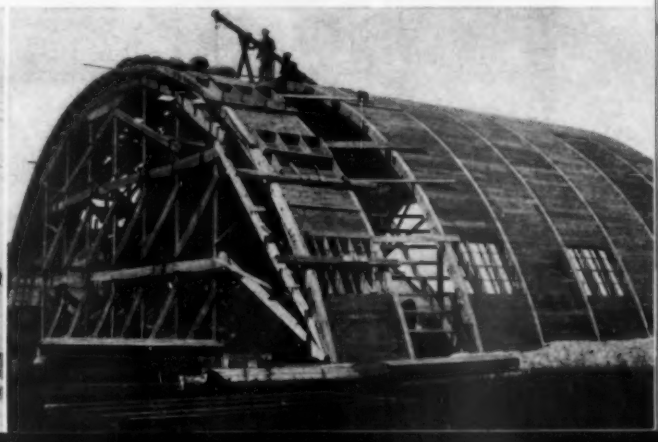


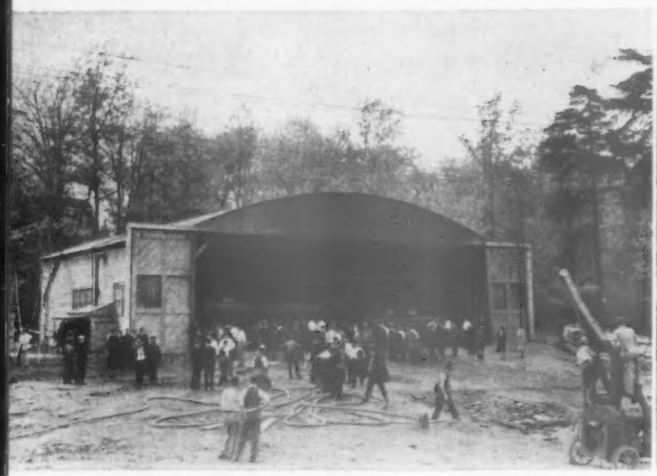
This wooden-topped hangar at Burlington, Vt., has a 100 ft. span built from a design and specifications of the Government. Modern timber connectors were specified in roof.

The 50 ft. bowstring trusses on this Wilmington, Del., hangar are wood. The top chords are glued to solid curved pieces of wood.

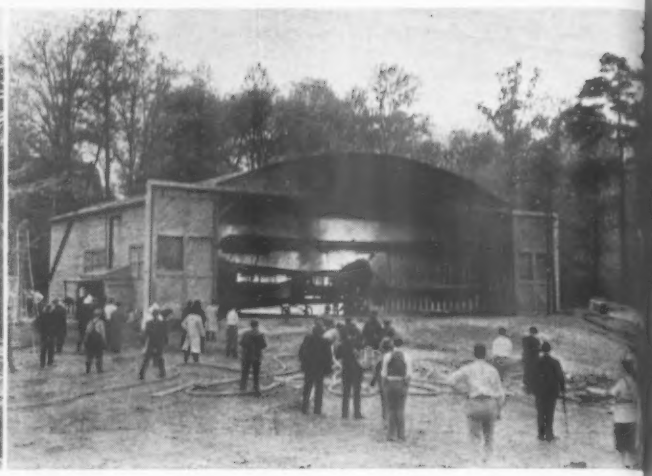


This unusual-looking hangar is entirely wood. Lumber experts have conducted research that has made cheap hangars possible.





1 This is a wooden hangar recently used to test for fireproofing. Four junked airplanes have been put in to be ignited.



2 Ten seconds after the fire was lighted, the hangar was one-third filled with flames. The firemen are ready at the hose.

Some timber connector roof structures are placed on masonry walls and in other instances the all-wood building is utilized to provide maximum space within fund limitations. In a few cases a wood-stud framing has been covered with large sheets of cement-asbestos composition, with corrugated sheet steel, or with the resin-bonded, weather resistant plywood now also used for aircraft construction. Practice in the colder climates favors a wall covering which definitely excludes air leakage and has some degree of insulation capacity.

An interesting and economical example of private hangar construction is supplied by J. T. Larkins, Professor of Engineering and Drawing at the Pennsylvania State College. Mr. Larkins, an aviation enthusiast, designed and built his own airplane hangar. After studying the cost and strength capacity of various materials he selected a timber connector framed truss as the most economical and adequate. He laid out the first truss himself and experienced no difficulty in fitting the members. The remaining trusses were then fabricated by hired help.

The hangar has proved entirely satisfactory to Mr. Larkins. The approximate cost was $1,200. The roof, which is covered with composition slate and asphalt shingles, is supported by five simple Fink trusses. The stress is carried through the joints by split ring timber connectors and a vertical member at the center of the truss acts as a means of suspending heavy loads from the lower chord. The center point is designed to carry 7,000 pounds of live load.

There is a line of purlins on either side (3x10s) to supoprt the mid-point of the 2x6 rafters. In order to reduce the cost of expert carpenter work, Mr. Larkins cut a pattern of each different piece and used it as a guide to rack of the others. He racked up 10 and 15 members using battens for cutting lines and had two common laborers use a crosscut saw and cut a pile at once. All framing in the roof was cut by two men in one day and the fits were perfect.

Mr. Larkins says that by assembling the trusses on the ground and using a pattern for drilling or boring the holes at the joints for the guide on the groove cutting tool, he found the fabrication extremely simple. After inserting the rings and bolts and making the truss into a unit he used a gin pole and snatch block to raise them to position. A Ford furnished the pull.

The trusses were placed on stone walls 18 inches thick and 10 feet high. The reason he used stone, said Mr. Larkins, was because it was plentiful at the site and the cost was approximately the same as that of other materials. The front doors are of the accordion type and give a 42 foot clear opening. They fold back to a size of 1 ft. by 5 ft. and are carried on a track fastened to the lower chord of the first truss. In the rear of the structure are two pairs of doors giving two openings of 10 ft. each for automobile use.

A hangar constructed of six, eight and 10-inch diameter logs, and using four Howe flat type 45 ft. span trusses with steel rod tension members was recently built for seaplanes near Bangor, Me. The bottom chord of the truss was made with 10-inch diameter logs, top chord horizontal members of eight-inch logs and the diagonal end posts of 10-inch logs. Six-inch diameter logs were used for the diagonal web members with ¾-inch round steel rods for verticals. Six-inch split ring timber connectors were employed to splice the logs in the bottom chord.

The sway bracing between trusses along the long dimension of the building consists of six-inch round logs butting in and notched to the top and bottom chords of the trusses. Purlins are 11-inch round logs attached to the top chords with spike grid connectors. In order to support the cantilever portion of the roof above the front entrance of the building, a double roof truss was placed 12 feet back from the entrance and to which secondary cantilever trusses were attached by means of four-inch split ring connectors.

The apron of this seaplane hangar slopes toward the water and has two tracks which support the plane as it is pulled into the hangar by means of an electric motor and cable. The building is braced along the outside by six-inch

This is the wood-topped hangar constructed by J. T. Larkins, Pennsylvania State College professor, for $1,200. Mr. Larkins designed and built the hangar with little help.

3 Roaring flames sweep out of the doorway 20 seconds after ignition. The temperature inside is 1,400 degrees Fahrenheit.

4 Ordinary sprinklers installed in the hangar are opened in 25 seconds. The fire is under control within 30 seconds.

5 The fire is practically out now. Everyone relaxed, the firemen's hose not needed. Automatic fire control declared victor.

6 Within 12 minutes the fire was entirely out and the smoke was clearing away. Spectators found the hangar undamaged.

logs running as cross bracing parallel to the walls. Corner bracing is accomplished with seven-inch round posts running diagonally from the upper portion of the corner along both rear and sides. These are framed into the posts with the use of bearing blocks which, in turn, are connected to the eight-inch vertical supporting posts of the structure by spike grid connectors. Steel plates and toothed shear plates in combination are used to reinforce the corners at the eaves of the building, and to anchor the walls to the foundations.

The lower ends of the corner posts are given a greater fixity by attachment of posts to steel plates and angles with 3⅛-inch toothed shear plates.

An airplane hangar was built at Wilmington with a span of 150 ft. and a 21-ft. rise. Web members 6″x16″ were attached to the top chord with 2½-inch split ring timber connectors. Four-inch split ring connectors were used to make splices in the bottom chord. The chords of the truss were built up of 2″x6″ members spiked and glued together to form top and bottom chords of two 6x12s.

The trusses were lifted into place when completed by means of a gin pole and spaced at 20-ft. intervals. A total load of 45 lbs. per sq. ft. of horizontal projection was provided for in the design. Each truss required 6,400 board feet of lumber and 256 connectors.

Another commercial hangar somewhat smaller than that erected at Wilmington was constructed at Burlington, Vermont, early this year. The structure, 80′x100′ with a leanto 20′x80′, was built from a design and specifications furnished by the Government.

Split ring timber connectors were specified in the design of the roof trusses. Fir novelty siding was used over the sheathing on the building proper with metal siding employed over the front doors. Trusses, purlins, and posts were of Douglas fir, with eastern spruce used for studding and sheathing.

The economy of timber connector trusses for airplane construction is easily seen in the following comparison of cost estimates prepared by a Federal Government department in 1935.

Three Warren-type timber-connector trusses for 40 pound live and dead load, 60 ft. span, and 20 ft. spacing, were figured at $503.75, f.o.b. job, ready for erection. Additional cost of purlins was placed at $285.60, making the total cost for roof frame $789.35. Fourteen 60-ft. bar joist steel trusses with nailer joists, on five-foot spacing for the same loading, were priced at $1,064.50. Three split I-beam steel arches for the same building, were estimated at $2,160 including purlins.

Five Warren-type timber-connector trusses with purlins, for 40 pound live and dead load, 80 ft. span and 20 ft. spacing, figured at $2,777 f.o.b. job, ready for erection, including wall columns designed for a 20 pound wind load. Five split I-beam steel arches for the same building were estimated at $5,280.00, including purlins.

Estimates of timber connector trusses

(*Continued on page* 70)

So you want to be an AIRLINE

The author (right) formerly was an American Airlines meteorologist, now is with Parks Air College.

METEOROLOGIST

by KENNETH A. WILLARD

There is no more important operations man on an airline today than the meteorologist. His is a profession that promises great things for the young man who wants to get into aviation.

SUPPOSE we look in on a typical major airline operations office on a bleak wintry day. Outside, a low overcast lends a dingy gray overtone to the surrounding scenery. Inside we find the usual setup with a dispatch desk, flight control center, pilot's planning board, weather desk, teletype and various other items of secondary interest.

We see three men huddled around the teletype that relentlessly beats out the day's weather conditions which, on that particular route, are very close to the operating minimums of the airline.

One of these men you know. He is the one in uniform—the pilot—in whose hands rests the ultimate decision of whether the flight will or will not go. Of the other two men one, the flight dispatcher, has long been an integral cog in the flight machinery of airline operations. The other—the airline meteorologist—is a comparative newcomer to this scene, but his presence in the group has reached a significance of such major proportions in the last few years that as a result a very definite demand has been created for men of his type. Unfortunately, the supply for adequately trained men for this position is limited, and it is this fact that we propose to investigate and determine the causes therefor.

Just what is an airline meteorologist? What are his responsibilities? What are his duties? Does the position offer an attractive career? And, finally, what training is necessary in order that a man may qualify initially for the job of meteorologist with an airline?

Stated in everyday terms, a meteorologist is a weather man, and an airline meteorologist is a specialized type of weather man who deals with not only the weather that we may expect on the surface but, what is more important, the flight weather that will be encountered in airline operations. He acts in the capacity of a staff assistant to the flight dispatcher. Insofar as his relative importance is concerned, he is subordinate to the flight dispatcher and to the pilot. This is true, however, only on paper, since in by far the majority of cases in which flight was cancelled it was done by mutual agreement between pilot, flight dispatcher and meteorologist. If we look at it in that way then we may say that the meteorologist assumed one-third of the responsibility for all cancellations due to weather.

The way it works is this: the meteorologist tells the flight dispatcher what he expects the weather to do. The flight dispatcher considers that information in conjunction with the many other considerations which confront the dispatcher such as the load, equipment, the balance of equipment, etc., and decides in his own mind whether it is feasible to operate the trip. Meanwhile, the pilot has talked to the meteorologist, studied the weather and reached his own conclusions. The final decision is reached by a comparatively straightforward process in which the three men go into a huddle and discuss all phases of the problem and come to a mutual agreement.

The duties of a meteorologist are varied, but can be roughly divided into two groups. First, his routine work and (second) the forecasts. A fully staffed airline meteorological office maintains a 24-hour watch on the weather, ordinarily divided into three shifts of eight hours each, during which time a close check is kept on all weather conditions and movements, together with a correspondingly close check on the position reports of the aircraft in flight. Then there are four weather charts to be constructed daily in which an air mass analysis of the entire North American continent is completed. From these four six-hourly maps the majority of the forecasts are drawn. Occasionally, in periods of extremely doubtful weather, intermediate three-hourly maps are also constructed for a localized sector of the country. The map-making work ordinarily requires from 2½ to 3½ hours of the total time available in an eight hour watch.

The forecasts which are issued vary with the different airlines, but in general the procedure is essentially similar. There are three major types of forecasts: First, the operations forecast, which is of a general nature and covers a period of from 40 to 50 hours and is intended to give an insight into the general weather problem which is expected. This type of forecast is usually issued once daily.

This is the meteorology school at Parks Air College. The author is standing at table (right) with a student.

Even the dashing Army pilot must wait until the meteorologists give them the go-ahead. These Air Corps pilots are "sitting it out" until the weather clears for them.

New scientific instruments are entering the field of aeronautical meteorology constantly. Above is the radio meteorograph which goes aloft on a balloon to chart weather.

Then there is the route, or section, type of forecast which covers a period of approximately 12 hours and is more specific in its use of terms for airline operations. For example, in the operations forecast the ceiling might be described as "Good" whereas in the route forecast it would be stated as "ranging from 3,500 to 6,500 feet." Lastly—and perhaps most important of all—are the individual flight forecasts in which a highly detailed forecast is prepared for the pilot of each trip, giving him the expected terminal conditions at his destination at time of arrival, corresponding information for his alternate airport, general conditions en route and finally the forecasted winds at altitude. Also there is a special section which is devoted to unusual conditions such as icing, turbulence, location of fronts and recommended altitudes for flight.

In addition to the routine duties and the forecasts mentioned, the meteorologist also is constantly besieged by requests for weather information from the sales department, publicity department and maintenance department. (Woe be unto the meteorologist who does not advise the crew chief of an approaching squall in order that the ships may be hangared.) As can be seen, the meteorologist has his hands full at all times and is particularly harassed during unfavorable weather.

The question may arise as to what opportunities a meteorologist may have after he has attained proficiency in that capacity. What opportunities does he have for advancement?

There are two directions in which a meteorologist can advance. First, within the department itself, he may begin as a junior meteorologist, then go to senior meteorologist, next divisional meteorologist and finally chief meteorologist for the airline.

The other course which can be followed, and which is coming more and more into favor with airline operators, proceeds somewhat along these lines: while working as a junior meteorologist, additional effort is spent in observing and studying flight control problems. After two years of service a man is eligible for the examination as Air Carrier Dispatcher and may be appointed to a position as junior dispatcher from whence he can continue to senior dispatcher, sector manager and ultimately operations manager.

There are some who will contend that a meteorological is cubby-holed. It is true that in the past there has been little opportunity for advancement in meteorological work. That, however, was not due to the limitations of the study itself but rather it was due to the limitations, through no fault of their own, of the men engaged in that study. When the airlines decided to utilize the services of a private meteorological system the men selected for that work were highly trained in meteorological work but, due to their specialization, had had little opportunity to observe other factors which enter into the airline picture as a whole. As a consequence they were catalogued as meteorologists and, with few excep-

tions, the men who began as meteorologists have continued in that capacity. The few exceptions were those men who, although highly trained in meteorological work, chose to consider it as an adjunct to flight operations, rather than as a complete study within itself, and proceeded to familiarize themselves with the many other phases of aircraft operation. These men have advanced to flight control positions and are excellently qualified to continue the promotional route in operations as outlined above.

With these men, training in phases other than meteorology came as a result of self-education. In recent years the training facilities for airline employees have advanced remarkably and it is no longer true that a meteorologist, should he wish to go up the ladder in operations, must resort to self-education in the operations procedures which are not definitely related to meteorology. It is my opinion that with proper training meteorology offers more opportunities for advancement than any other of the ground jobs in airline operations.

It will be noted that I have qualified the statement above with the condition that a man must be properly trained. What constitutes this training, and where is it available? Suppose for the sake of brevity that we assume the high school education in its general nature has been completed and that the high school graduate is considering airline meteorology and its subsequent opportunities as a career. He then can investigate the possibilities of three subsequent variations to his high school education in preparation for the meteorologist's job.

First, there are the colleges or universities with their various social, educational and economic advantages, all of which are capable of giving a good general background for specialization. It is advisable, if this course is selected, that the student major in physics or mathematics and, whichever subject he may choose to major in, carry the other as a minor. After graduation—if we assume that his work has been of a satisfactory nature—he is eligible for the graduate work at those institutions which have highly developed meteorological departments, such as California Institute of Technology and Massachusetts Institute of Technology (to name the two best-known schools of this type). Intense courses in theoretical meteorology are given in these schools. In addition, a very generous portion of the daily work is devoted to meteorological laboratories, which is of utmost importance to the practical meteorologist.

Upon completion of the work in the graduate school—again assuming that the student's work has been satisfactory—he is awarded the degree of Master of Science in Meteorology and may be considered as efficient a meteorologist as can be presented to an expectant industry. However, his specialized training has been restricted to meteorology and he will require additional training in airline work before he can qualify for the job as an airline meteorologist. This type of preparation is excellent, but in most cases those men who follow this

These are pilots and meteorologists of Pan American Airways conferring prior to a transoceanic flight. Pan American has one of the world's finest weather departments.

educational procedure are well qualified to carry on theoretical investigations. A large number of them choose to continue in the academic field rather than to augment their meteorological education with airline information and assume a position with an airline.

Another way in which the high school graduate can carry out his meteorological education is through the Army or the Navy. The military services give excellent courses in meteorology and there are several former Army and Navy men working with the airlines at present and doing an excellent job. I am not qualified to describe the courses offered by the services but I do know that they must be complete because the men of my acquaintance who have taken the course are usually capable of understanding and coping with all of the meteorological problems which come up. However, because of the military character of this type of training, its scope insofar as airline work is concerned must necessarily be limited. Some men in the industry may tend to disagree with that statement, but I think if they reconsider they will agree with me that their usefulness to the airline—outside of their ability in a purely meteorological classification—has resulted from their own efforts which they have expended in studying the airline operations, rather than as a result of their service training. One very excellent point in favor of the service training is that, for the student with definite limitations on finances is paid while learning.

Both of the foregoing educational variations with respect to meteorology give ample evidence of their worth when one considers the number of men engaged in

(*Continued on page* 85)

You probably see the above scene at your local airport but fail to realize its importance. Vari-colored balloons are used, depending on the sky. These are followed with the telescope-like theodolite to determine the direction of winds at the various altitudes normally used by planes.

WINTER

by

ROBERT STEWART

The Boeing B-17 takes off in search of some rough, icy upper air conditions.

★

This is what an Army pilot looks like after preparing for the wintry blasts.

Once again the Army Air Corps sent its various types of aircraft after the worst cold weather the ships could find. This year they found enough nasty weather to warrant this story.

THE Army Air Corps concluded its annual cold weather equipment tests at Selfridge Field, Mich., recently without mishap of any kind or even a serious case of frostbite reported—but with a number of lessons in sub-zero maintenance well learned.

More than a dozen Army airplanes of assorted shapes and sizes gathered at Selfridge Field for the tests; a composite squadron of seven combat craft, manned by 18 officers and 25 men, participated in the gruelling six-day expedition into the northwest in search of winter's worst.

Reports prepared by Col. Laurence F. Stone, commanding officer of the Third Air Base (which is Selfridge Field), and Lieut. John K. Gerhart, cold weather test operations officer, reveal some of the difficulties encountered and some of the measures planned or stumbled upon to meet them.

Planes used in the test presented a cross-section of the combat equipment of the GHQ Air Force, and came from air bases as far away as California. Included were:

A four-engined Boeing B-17 of the Second Bombardment Group, Langley Field, Va.

Twin-engined Douglas B-18's from the 19th Bombardment Group, March Field, Cal.; the Seventh Bombardment Group, Hamilton Field, Cal., and the Second Bombardment Group, Langley Field.

A B-18 patrol plane, also equipped with power winch and 7,000 feet of cable for towing aerial targets, from the 21st Reconnaissance Squadron, Langley Field.

A sleek, twin-engined Curtiss A-18 attack ship, designed for the strafing of ground troops and positions at low altitudes, from the Third Attack Group, Barksdale, Field, La.

An O-47 observation plane from the 97th Observation Squadron, Mitchel Field, L. I., N. Y.

A B-10B Martin bomber attached to the Air Corps Materiel Section, Wright Field, Ohio.

And three swift Curtiss P-36A pursuit planes from the First Pursuit Group, Selfridge Field.

Most of the motley assortment of military aircraft had gathered at the Michigan base in January, only to run into a spell of unseasonably warm weather and have the tests postponed on account of

RENDEZVOUS

heat. The day they left Selfridge a severe cold wave set in and a blizzard followed the east-bound ships all the way home.

Returning early in February, officers in charge of tests found weather maps more to their liking, and on February 7 dispatched the composite squadron of seven ships to Wold-Chamberlain airport, Minneapolis, to meet an advancing cold front which threatened to produce one of the nastiest bits of weather of the winter. Army meteorologists were certainly correct.

With the exception of the B-17, all ships flew directly to Minneapolis and staked down for the night. The *Flying Fortress*, with a crew of 12 officers and men aboard—and gasoline for 1,500 miles of flight—flew over Minneapolis and, without refueling, plunged into the teeth of an advancing blizzard bearing down from the northwest.

On instruments for nearly two hours, bucking howling headwinds heavily laden with snow and sleet, the 20-ton craft finally climbed on top of the stuff at 22,000 feet to get into the clear, forcing all hands to drag deeply on oxygen tubes. And while outside temperatures ranged downward to 13 below zero, the big ship's steam heating equipment kept cabin temperatures above 40 degrees at all times. The swing around the northwest took the B-17 over Duluth, Fargo and Bemidji, Minn.—the last named being traditionally the coldest spot in the United States.

All planes—the B-17, two B-18's, the O-47 and three P-36A's—were staked out overnight and by morning were half buried in snow. Then the fun began. Throughout the five days the Army airmen remained at Minneapolis, temperatures remained at zero, or below, with but one exception—a few hours of barely freezing temperatures which produced a freezing rain.

Various types of skiis and ski-wheel combinations have been tried, but Army engineers discarded them all.

This suction-cupped tire was tried as a possible means of eliminating skids on runways or frozen lakes.

After a night staked down out in a roaring blizzard, the groundmen found plenty of scraping and digging necessary.

Because their engines were of the air cooled variety, Army crewmen experienced none of the radiator trouble common to winter motoring, and because an oil-dilution system first tried at Selfridge Field two years ago is now standard equipment, there was no difficulty with crankcase lubrication. But—everything else froze! Engine starters, carburetors, fuel tank selector valves and even condensed moisture in the bottoms of the gas tanks.

Direct application of heat, of course, was the answer to most of these problems—and Navy mechanics attached to the Naval Aviation Reserve Base at the Minneapolis airport, provided the mechanism, consisting of an ordinary plumber's blowtorch and a 10-foot length of three-inch flexible metal hose.

As a matter of fact, officers in charge of the tests are perfectly frank in admitting that the simple, old-fashioned methods of combating the effects of cold proved the most efficient. Most difficulty was experienced after a freezing rain had deposited an eighth-of-an-inch layer of clear ice on the wings of the staked-out fleet of warbirds. Chipping, tapping with a rawhide mallet and scraping were ineffectual; rubbing with a solution of alcohol and glycerine (the same as is used in the propeller slinger rings to prevent air screw icing in flight) was too slow.

Then someone conceived the bright idea of boiling up 200 gallons of water and scrubbing the ice sheath. This was done on the 105-foot wing of the B-17 (which happened to be nearest the water boiler), followed immediately by a brisk alcohol rub to prevent freezing of the hot water. And despite the prevailing temperature of 10 below zero, it worked to perfection, although it cannot be said the enlisted men particularly enjoyed the task.

Wing covers of canvas, designed to prevent such accumulations of ice and frost on the ground, had shrunk following a previous exposure, and no longer fit. Odd-lot tarpaulins were used on subsequent nights, with good effect.

A fancy new gadget patterned somewhat after the common household electric warming pad, but of sufficient proportions to enclose a 1,200 hp. engine, proved only partially effective, and crewmen resorted to the old-fashioned individual engine "pup-tents", complete with oil stove. It is conceded, however, that the electric warming blankets (which take 110 volts) may be improved in time. Meanwhile, though, all sorts of devices intended to remedy this condition have been offered to the Air Corps by inventors and manufacturers. Many of these may have a certain amount of promise.

But with the engine tents, the motors of one of the B-18's not equipped with oil-dilution hoppers, its cylinders so heavy with frost that they resembled the cooling coils of an electric icebox, were warmed and started in three hours after three days of exposure to subzero temperature.

Other problems included the clearing of spark plugs shorted by the freezing of condensed vapor across their points and the rolling and packing of snow-drifted runways. In the latter instance, a combination harrow, scraper and heavy roller, drawn by a Diesel caterpillar tractor, readied a 3,500 runway in an hour after a heavy snowfall which had drifted badly. And the resulting landing surface was so hard that the 20-ton *Flying Fortress* scarcely left a wheel track in landing. In the eyes of Army observers, this method of preparing runways cannot be bettered in regions of heavy snowfall.

Another difficulty met with a simple remedy was the frosting of cockpit and cabin windows of the bombing craft. Little squares of glass, which are Army found to be in common use on the Lockheed airliners of Northwest Airlines, were taped to the panes with good results.

As for the protection of personnel from the elements, while fur- and fleece-lined clothing is necessary on the ground, enclosed cockpits and aircraft heating systems render these items unnecessary in the air. And baseball caps remain the vogue among the pilots, at least among pursuit pilots.

Probably the most embarrassing instance of equipment failure was the shattering of several pilot "relief tubes", which, being made of bakelite, were found to become brittle and easily broken after long exposure to subzero temperatures.

On the return flight to Selfridge Field, the B-17 engaged in a bombardment expedition over the ice floes of Lake Superior in the neighborhood of Duluth, dropping 100-pound sand-filled projectiles. Other ships in the composite squadron detoured over the gunnery range at Camp Skeel, on the shores of Lake Huron, to practice machine gun operation. But there were no cases reported of any failure of aircraft armament due to cold weather or icing conditions.

While the Army flyers may have felt a bit sheepish about accepting the hospitality of the Naval reservists, they were duly appreciative of the technical assistance rendered by both Naval and airline maintenance crews, and of the warm quarters available at the reserve base.

All equipment used by maintenance crews was transported by air from Selfridge Field, including oil stoves, pup tents, etc. Even spare parts were flown to the Minneapolis field by Army craft. All communication between Selfridge

(*Continued on page* 86)

This is the B-18 at the top of the page after being dug out and prepared for flight.

Stand By For HOWIE WING!

Bill Moore is as interested in model airplanes as is his son.

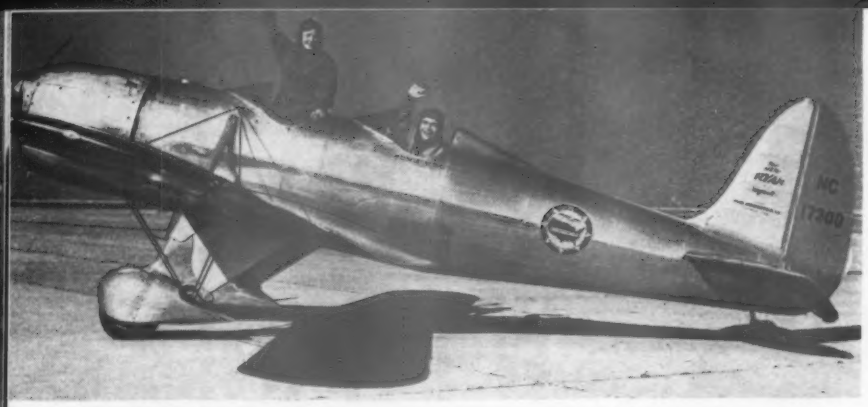
by *JUNE AULICK*

Capt. Bill Moore is a veteran airman who has a mania for accuracy. Hence, his nationally broadcast radio aviation serial is doing much to educate the young ones.

EVERY time I think of Bill Moore, I can't help thinking of Harry Copland. If you know both men, you'll agree they have little in common. I don't believe they've ever met. Both are pilots—captains, as a matter of fact, in the U. S. Army Air Corps Reserve. Both are members of the Quiet Birdmen. Harry Copland, also an Early Bird, is at the Wayne County airport near Detroit with Airways Traffic Control of the Civil Aeronautics Authority. Both Harry Copland and Bill Moore have the same ambitions—to live long and fly for the rest of their lives. Each has an adage for his ambition—and there lies the reason for not being able to think of one without thinking of the other. Bill Moore says, "I want to be the kind of a pilot who makes a perfect landing, steps from the cockpit and then trips over his long gray beard." Says Harry Copland, "There are old pilots and there are bold pilots, but there are no old, bold pilots."

But let's get to Bill Moore. Christened Willfred G. Moore at his birthplace in Saginaw, Michigan, 42 years ago, the life pattern of Bill Moore would make an aeronautical tapestry worthy of display wherever priceless aviation tokens are exhibited. His schooling at Saginaw and also at Green Bay, Wisconsin, led him to Cornell in 1916 where his college

This is an actual Howie Wing broadcast from the cabin of a high-flying airliner. That's Bill Moore with the earphones and Howie Wing himself is speaking into the mike.



Howie Wing (enacted by Film Actor William Janney) is in this Ryan's cockpit with Donna Cavendish, the radio serial's heroine, in the front seat. The ship was rented.

This is Bill Moore in Army regalia. He is an active Air Corps Reserve pilot.

education was interrupted by the World War. As a pilot he served overseas (at the front with the Royal Flying Corps) and returned with a wealth of experiences, two military decorations and the urge to go far in aviation—an industry just in the creeping stage of its infancy.

Gathering a few pennies together Bill Moore bought a war surplus Jenny and went a-barnstorming, like so many of his fellow World War pilots. Aboard the Jenny he carried wing-walkers, parachute jumpers and other aerial artists who reaped a harvest of gold from county fairs, farm expositions and small, unsophisticated towns. Bill barnstormed up in Michigan with the late Frank Hawks and later saw nearly every state in the Union from the cockpit of his faithful Jenny.

Romance stirred the heart of Bill Moore in 1924 and he took Mary Kinnavey as his bride. She was already a well-known journalist and feature writer. Bill landed a position as a test pilot for the Inland Aircraft Company at Kansas City and proved the worth of the Inland high wing monoplanes in the early thirties. He added many laurels to his well-stocked crown while with Inland. He became the factory's general manager and best demonstration pilot. In 1930 he flew in the Shell Trophy race when the National Air Races were held at Chicago. During this meet he set a world's speed record for lightplanes, a mark that has since been broken abroad, but one that still stands as a U. S. record. In 1930 he sped across the six picturesque New England states as a participant of the fabulous New England air tour. Later, he took part in the dedication of the $1,000,000 Bowles-Agawam airport (now a horse-racing track) and won the feature events for planes in the Inland class.

It was the same Bill Moore who was the first one to fly a lightplane from the United States to Mexico City. He did a lot for lightplane flying—predicting that the great masses would be the owners of lightplanes in the future. All this was very exciting but not especially lucrative. One night in their home at Kansas City, the Moores were listening to an aviation radio skit that glistened with technical inaccuracies that even the most inexperienced aviation fan could detect. Right then and there Bill Moore asked himself who could better write an aviation radio drama than a man who knew what flying was all about. He certainly knew what flying was all about and devoted his spare time to pecking out a few script ideas. Bill Moore joined forces with another pilot named Bob Burtt, and the two airmen decided to write and produce an aviation script.

"Jimmie Allen" was born at this point, and an aviation youth organization was created by an oil company. Two million children every day listened to the exploits of Jimmie Allen and not once did anyone ever detect any aviation term or situation that was not accurate, because the Jimmie Allen script was written by two men who could see over both sides of the fence. Mary Moore shared Bill's literary enthusiasm and ability. Today she is an outstanding literary critic and does book reviews for a number of leading magazines, including SPUR. With the success of Jimmie Allen behind him—Jimmie having been portrayed in comic strips and on the motion picture screen—Bill Moore created a new figure to be the idol of American youth. He christened his new idol Howie Wing. Today Howie Wing is a household word in hundreds of thousands of American homes. Howie is a typical American youth who learned to fly at the U. S. Army Air Corps training schools at Randolph and Kelly Fields. His adventures have led him to far-off Newfoundland, across the Atlantic aboard a *Clipper* and through a hundred dramatic situations.

The adventures of this young American aviator are told every night, Monday through Friday, on the nation-wide network of the Columbia Broadcasting System. The hundreds of letters addressed to Howie Wing that reach Bill Moore's desk every day have led to his conviction that the youth of America today embrace aviators as their heroes,

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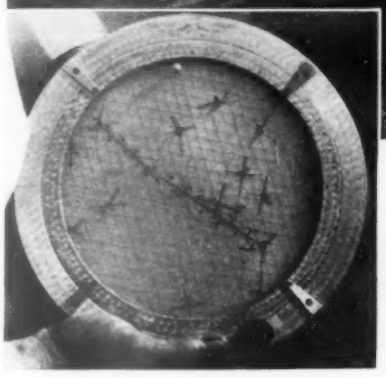
Here's the Howie Wing program in action. The studio sound effects man and Bill Moore (right) are responsible for the roaring engines, etc. Actual plane sounds are on records.

Stark (left), Sam Griesmer and Murl Estes try out their position finders (see inset below).



DOCTOR OF SAFETY

by GEORGE R. REISS

When a pilot gets thoroughly scared in a tight spot he usually pats the ground—if he lives—and promises "never again!" But Horace Stark went farther than that.

ONE black, stormy night, nearly a dozen years ago, a tiny open mail plane groped cautiously through the wilderness of fog and wind and freezing rain and gaunt, darkened farmhouses that was southern Ohio at night.

Crouched in the unprotected cockpit a grim-faced, boyish pilot, tense, tight-lipped and red-eyed from wearing strain, searched the wilderness hopefully, seeking the dull glow that might mark a city or town, a tiny pinpoint that might be an airway beacon—anything that might be a faint clue as to his whereabouts.

He was alone, forlornly alone—and lost.

"If I get out of this alive . . . " muttered Horace Stark, tersely. He dabbed at the glare of frost on his goggles. It left only an opaque smear. Raising them, he absorbedly studied the flitting gas gauge needle. It indicated ominously that a landing, some kind of a landing, was near. He studied the array of instruments that seemed suddenly gone mad. He noted the light glaze of ice building up on the wings and struts and wires, which howled like a mad dervish.

Wisps of fog raced wildly past his cockpit. Already the ice-laden wires and struts protested with an increasing whine against the load, setting up a terrible, teeth-rattling vibration, a vibration that threatened momentarily to rip out the ship's motor and hurl it to the ground.

Long ago he was due in Pittsburgh, he reflected. Pittsburgh? The pilot's dulled senses toyed with the name. It aroused something in the back of his mind; something remote, far-off, impersonal like Beyrouth, Singapore, Hankow.

What's that? A light? God, it seemed close to the ship's outstretched landing gear. A street light! Another! Another! And a dull glow lightening the fog.

" . . . I'll invent something so that pilots no longer need go through this hell, something to help to find their way," he finished.

Well, Pilot Stark came through alive that night—and Pilot Stark has kept his pledge. For out of that determination was born a pair of outstanding aids to aerial navigation—the Stark position finder and the Stark airport orientator. And there are more to come.

No, it wasn't quite as simple as that. The solution wasn't a spontaneous idea, born of a single fleeting spark of brilliance. It took thousands of air hours and more thousands of "laboratory" hours—disappointing but persevering hours—to find the solutions.

For these twin inventions were not born of theories in the aeronautical laboratories, in the brain of an aeronautical engineer. They were born in the darkened cockpit of an airliner, in the brain of a hard-headed, practical airliner skipper, to fill a practical need.

Today, you will find the twin gadgets doing duty in the cockpit of many an airliner or private airplane: the position finder to help to swiftly and accurately

Stark's airport orientator.

find lost positions, and the orientator to help to guide the ships safely into fog-bound strange airports.

Now a word about our subject, Captain Horace. Keep a wary eye on him. For he has a couple more ideas on the fire, ideas that will blossom any day now to lick some of the remaining problems of aerial navigation, ideas that yet must be kept strictly under the hat because of patent laws.

Captain Stark's recent inventions have so brought him into the aeronautical foreground that we, the aeronautical public, have a right to scrutinize his background. So, meet our subject: Horace Stark, inventor and Pennsylvania-Central Air Lines captain.

Physically, he doesn't fit the popular concept of the veteran of the airways, a grizzled, bottle-scarred fellow, picturesque, broad-shouldered, loud-talking. Instead he's a slim, youngish, quiet, unobtrusive chap; a lad who could pass for a college senior. But he rates in his own right among the grand-daddies of the airline pilots—a veteran of 17 years and 10,000 hours aloft.

Stark got his aeronautical education, such as it was, the hard way. For he was schooled in the practical side. Born and raised in New Jersey, he went through high school at the head of his class. Then, grasping his diploma, he was thrown unceremoniously on his own, for his parents were dead and he had to make his own way.

"What now?" he asked himself, taking stock. Aviation, he told himself, was the answer. But flight training, even in the Jennies and Standards, cost money. Gobs of it. But young Horace was a determined cuss. He tackled odd jobs—anything that presented itself—and earned enough to learn to fly. Then, with barely enough experience to solo safely, he started his flying career, hauling passengers, training students—for there were no regulations then.

Stark has one of the most diversified, well-rounded-out airline careers. In 1928 he began it, joining the old Clifford Ball line which trundled the mail between Cleveland and Pittsburgh, via Youngstown, Ohio. Then, in 1929 and 1930, he flew a Ford tri-motor for Pan American Airways in Central America over the stinking, steaming jungles, often through the clouds and mists that blanketed the 20,000 foot peaks that lay between Belize, Honduras, and Tela, Nicaragua. But life in Central America had its moments for Stark, an avid hunter and fisherman. For the seas abounded with fish and the jungles with game, and Stark enjoyed the sport.

Returning north, he flew for the old Transamerican Air Lines, from 1930 to 1932, on a mail run between Cleveland and Bay City, Mich.; on an amphibian line across Lake Erie between Cleveland and Detroit; and on a Fokker tri-motor run, between Detroit and Chicago.

From 1932 to 1933, he flew for American Airlines, between Detroit and Chicago. From 1933 to 1934, he flew for Pennsylvania Air Lines between Washington, Pittsburgh, and Cleveland. From 1934 to 1936, he flew for Central Air Lines between Washington, Pittsburgh, Cleveland, and Detroit and, since 1936, for Pennsylvania-Central over the same route.

Without any engineering training to start with, Captain Stark finds himself in the unique place of having contributed outstanding engineering accomplishments through his inventions. But what engineering knowledge he has acquired by doing his own drafting work and through association with those men who lead the field in this profession.

Both Stark's devices are simple little gadgets, easy to operate, inexpensive and absolutely accurate. The position finder is the result of Stark's revolt—and that of numerous other harried airline pilots—against the old inaccurate methods of fixing positions in the air with the aid of direction finders, large paper sectional maps, protractor, slide rule and pencil.

For this old method was guesswork at best, always subject to mathematical miscalculations in time of stress when need for accuracy was the most urgent. It was a difficult, unwieldy job in the narrow confines of a crowded cockpit and the "paper work" only added to the pilot's already arduous work.

The spark came one rough, boisterous day when Captain Stark, wrestling with his controls in an effort to keep his ship on an even keel as it bucked, yawed, pitched and rolled in the rough air, sought to work out a position with a paper map, ruler, protractor and pencil.

Suddenly the ship yawed in a rough air current, fell off, while the startled passengers clung apprehensively to their seats, their knuckles white. Stark recovered his crumpled map, then sought his tools on the cockpit floor. Already his figures were useless for the ship had progressed miles in those few minutes. So Stark, struggling patiently again with the protractor, rule, pencil and map, started to work on a new fix. Again the ship yawed, losing him his work.

"X$%C G T &_ V_'8," said Stark—or words to that effect. "Why can't we get a system simple enough to take a fix without needing a whole drawing room table."

Suddenly he sat bolt upright. "That's it," he said. "I'll make it. A simple position finder."

Finishing his trip, Stark went to work at once, spending many hours with the problem of making a simple position finder that would banish forever the time-taking "paper work", the guesswork and the danger from mathematical miscalculations in the overcrowded pilot's cockpit. His simple position finder is the result.

The instrument is the smallest, lightest, simplest and most versatile instrument known for fixing the position of aircraft while in flight. Resembling an ordinary calculator in appearance and operation, it is so small that it may be held on the pilot's knees and be operated by him while he flies the airplane. It is merely a small disc, eight and a half inches in diameter and an inch thick and weighing 20 ounces.

The position finder involves use of a special transparent sectional map of radio broadcast and range beacon stations, covering an area 520 miles in diameter and overlapping approximately 300 miles to connect sections or to cover a route. Twenty-two such maps cover the entire country and are interchangeable on the disc.

These maps are reduced down from standard, accepted flying maps by photography. Although the scale of the map is quite small, 80 miles to an inch, it is possible to establish a fix within very fine limits, particularly along course lines where the mileage is accurately marked off.

Underneath the map on the position finder are two rotating discs, of similar transparent materials, marked at 20 mile intervals with parallel lines. To take a fix, the pilot merely tunes in on his direction finder to one radio station, transfers its bearing reading to one of the line discs, then takes a bearing on another radio station and transfers its reading to the other disc. The converging lines show on the map the exact spot over which the plane is flying. The finder is indeed versatile, helping to solve a pilot's navigational problems in a score of ways.

"Of additional significance," said Stark, "is the fact that in position finding work, there are problems facing the pilot other than simply locating the spot over which his plane is flying. If he has been lost for some time, his gasoline supply usually will be running dangerously low, making it imperative to land soon. That's where the position finder fits in again. You can't afford to miss. The instrument, for such a situation, not only gives the complete layout of airports in a given vicinity, their beam patterns and so forth, but shows this in relation to the plane's position—and it provides the means for laying off a course to one of these ports and for determining the exact mileage."

Then there is Stark's other gadget—the airport orientator—which he describes as "the connecting link between the en route flying aids and the blind landing

(*Continued on page* 84)

Here are some tips for the lightplane owner. The little ships will serve their owners long and well if they are given proper care.

TAKE CARE OF YOUR LIGHTPLANE

by F. E. NAGLE

WITH the ever increasing popularity of the light airplane, the matter of keeping such planes in good flying condition is one which is of some concern to all the owners. All in all, present designs are somewhat simple as to construction, although some of the latest types feature conditions of rather complicated type, insofar as production permits. Present types feature long life components, and frequent replacements of parts are not necessary which, while for the best, does not tend to keep the owner conscious of the fact that he should keep up maintenance on the ship.

In maintaining a lightplane, or any other airplane, for that matter, the first thing necessary is a check of both plane and engine at definite periods. Use of a check chart or list for both plane and engine is a necessity, for then little is left to memory, and such charts can be kept on file for future reference. Contrary to popular opinion checks take very little time, either for plane or engine, if done on a lightplane. The average complete check of both should not take more than half an hour for the inspection, and maybe a little more for minor adjustments. It is recommended that this procedure be gone through after each day's flying, for then it is known what the ship has gone through during the day, and adjustments or replacements made to rectify any faults.

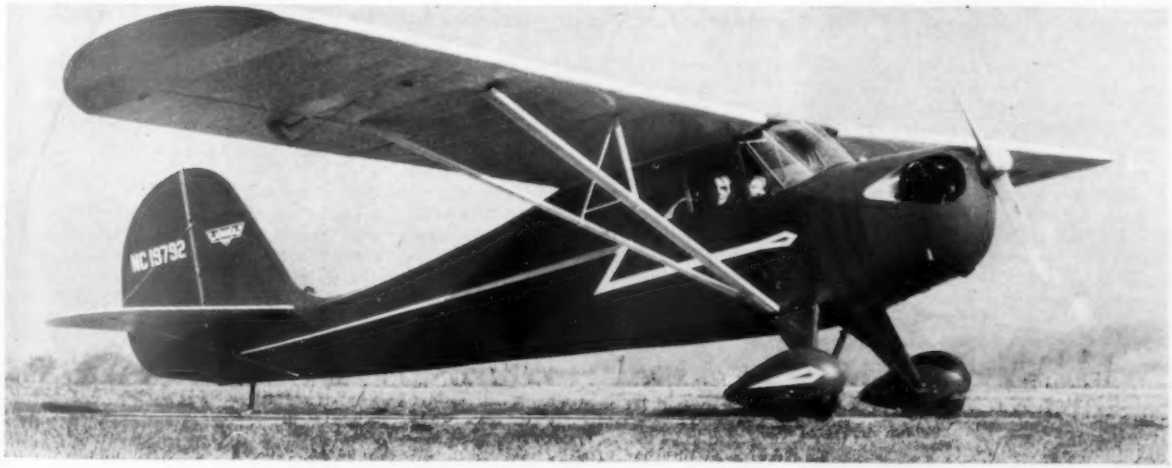
Any qualified mechanic should be able to set up a list of items to be checked off daily, both for the plane and its engine. An excellent source of comprehensive inspection lists and check cards will be found in any of the aircraft insurance companies. While the lists they furnish may contain many superfluous items, they will serve as an excellent guide for drawing up a check card for the ship you are interested in. In connection with the insurance firms, it is interesting to know that they constantly keep records on parts and material failures on all popular ships and thus are in a position to warn owners of impending trouble with certain parts of the ship, which enables changes or modifications to be made before trouble occurs.

All production models have certain faults, due either to design or to the type of operation undergone. Some manufacturers send out replacement parts for those of which fail through faulty design and it is required of the owner to have these installed as soon as possible. In all instances, it will be found necessary to have such revisions made before re-

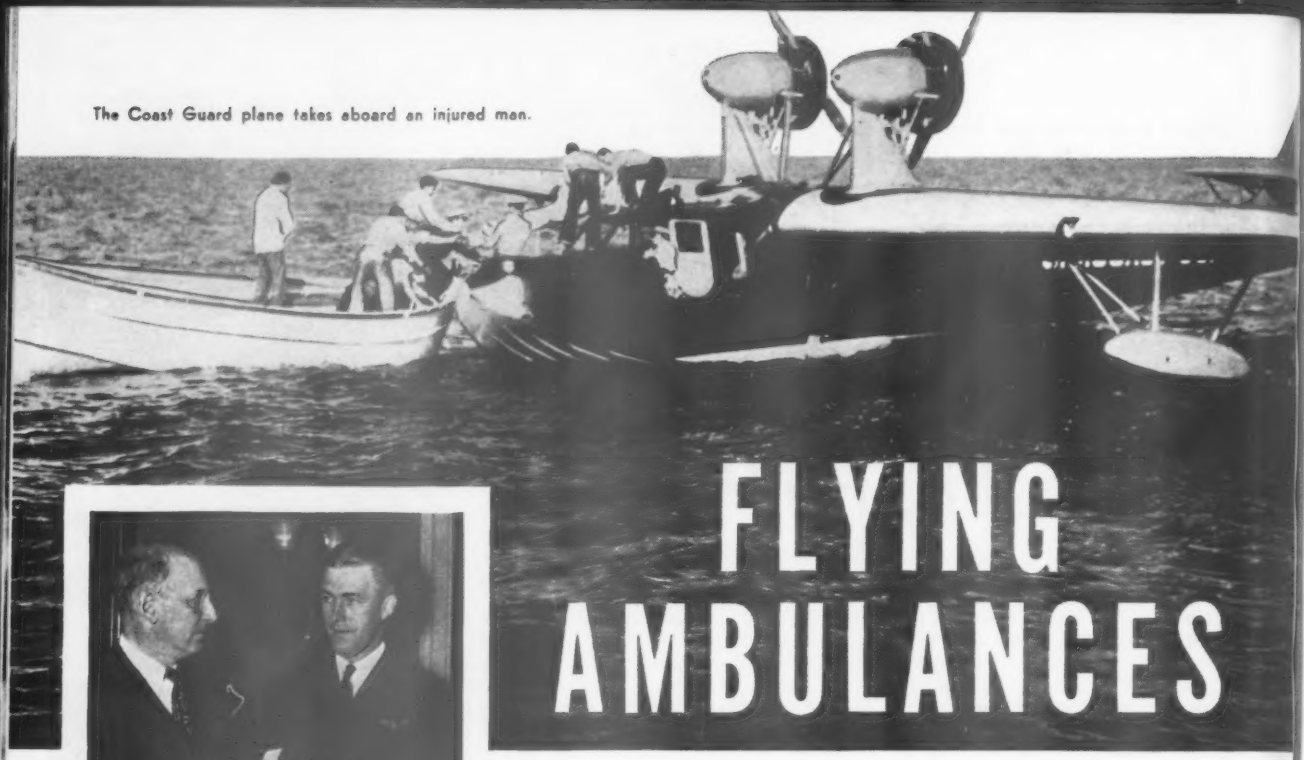
It is necessary to check your lightplane periodically. Inspections take little time.

licensing. Some owners may desire to reconstruct parts of the ship which give them trouble, due to the use which they have for the ship, and in all cases they should first contact a CAA inspector to insure the approval of the change. Often the inspector can show the owner that proposed changes would be valueless though, often as not, he can suggest

(*Continued on page 72*)



The present-day lightplane is a full-fledged airplane requiring comparatively little attention.



The Coast Guard plane takes aboard an injured man.

FLYING AMBULANCES

Secretary of the Treasury Henry Morgenthau, Jr., is shown presenting Lieut. C. B. Olsen with the Distinguished Flying Cross.

by GEORGE H. DACY

Uncle Sam's aerial Coast Guardsmen have a niche in aviation history all their own. Their work is a symbol of humanitarianism.

THREE HUNDRED miles off Miami between the two easternmost rock-ribbed isles of the Bahamas impending tragedy in the Army transport *Republic* was riding wild waters; a tempestuous sea roared defiance as vivid flashes of lightning illuminated the angry ocean stirred by violent winds. In one of the cabins of the tossing ship Lieut.-Col. Walter Gullion lay in critical condition, closer to death than either his wife or daughter even suspected. Sheer speed, the annihilation of great distance in record time, the transfer of the suffering officer from ship to the hospital operating room in a race against the shadowy grim reaper was necessary. The top speed of the *Republic* maintained constantly for four days would deliver the patient in New York City—but much too late. A Coast Guard cutter might steam out to the ship, remove the passenger and transport him to a Miami hospital in 36 hours—but not fast enough.

Could a seaplane outwit the aroused elements, answer the distress call, and transfer the sick officer to shore in time? The commanding officer at the Miami Coast Guard hangar evidently thought so as he read the terse radiogram. "Night flight, Olsen," he said, handing the message to his chief aide, Lieut. C. B. Olsen, "two-seventy miles out," meaning that the flyer must contact the *Republic* near a rendezvous called Hole in Wall passage in the Bahamas. A flying junket to test the capability of the best-seasoned birdman, with weather conditions the worst, and the odds against a successful flight colossal.

The *Arcturus* with Lieutenant Olsen at the controls took off through thick weather with a full load of gasoline. Despite the heavy thunder and lightning storms met by the ship, radio contact was maintained with the *Republic* during the entire flight; 3½ hours after the take-off the searchlights of the *Republic* were sighted. Circling several times on the starboard side of the vessel and heading into the wind, Lieutenant Olsen descended into the squally rains, clapping thunder and alternations of inky blackness and lightning flashes. It was a sensationally dramatic moment for the passengers crowded at the ship's rail as the *Arcturus* came up abeam of the *Republic* until her hull slashed into the rolling choppy water in a nicely maneuvered landing. The big plane taxied to a safe distance off the transport's port quarter as the passenger ship swung broadside to the wind to form a lee for the lifeboat containing Lieutenant-Colonel Gullion strapped securely to a safety stretcher, his wife with a life preserver fastened around her body, and a hardy crew. The transfer of the stretcher patient from boat to plane was difficult due to the roll and pitch but 50 minutes after the arrival of the plane she took off again with the sick man and his wife aboard.

The take-off was unusually difficult. The pilot, on gaining altitude, had to fight the storm head-on as his gasoline supply was not sufficient to permit any detour around the storm sector. It was a pitchy, bumpy trip with the pilot using instruments almost exclusively. Radio contact was kept with both the Coast Guard base and the headquarters of the Tropical Radio Station. Powerful engines purred rhythmically as a tail wind aided the race against death.

Lieutenant Olsen turned in another victory for the Coast Guard "ambulances of the air," the ships of mercy which invariably answer emergency calls of distress. Three hours after the *Arcturus* rose from that welter of storm-lashed water and gained sufficient altitude to

turn tail to the wind and swing back high above the port side of the *Republic*, Lieutenant-Colonel Gullion was being admitted to a Miami hospital. An emergency operation saved his life in the very nick of time. Simultaneously Olsen wrote the report of his epochal excursion in this routine wording: "flight 706 miles, total time in air, 6 hours and 40 minutes, 550 miles sea rough, minor damage, rivets starting small leaks due to rough landing."

That was the end of it—so the Lieutenant believed. Just another assignment completed in the efficient style in which he had been taught to perform such. Little did he imagine that eventually he would be standing at attention while Secretary of the Treasury Henry Morgenthau, Jr., pinned aviation's highest decoration, the Distinguished Flying Cross, to his jacket. But that's what happened. Such flying exploits are appreciated and rewarded. For the first time in history a skilled and courageous Coast Guard pilot was thus honored.

There will be more such decorations bestowed on these daring pilots who patrol our coasts, succor the lost and suffering, help to snuff out smuggling, and pilot their big planes successfully in fair weather and foul.

This stunt of the Coast Guard birdmen of removing sick, suffering or wounded patients from ships at sea and flying them at top speed in all sorts of weather to Miami or Jacksonville stations and hospitalization is not as simple as it sounds. When radio contact is made by the plane with the ship to be intercepted the master frequently makes the mistake of believing that a smooth sea with no wind constitutes an ideal landing condition for the Coast Guard seaplane. Few ship masters ever radio reports on the swells despite that the occurrence of swells under light wind or no wind conditions make takeoffs particularly difficult.

The usual radio-communication arrangement made between the ship captain and the seaplane pilot is for the lifeboat with patient and crew to be lowered to the water as soon as the plane initially circles the ship. Usually the seaplane circles the ship once or twice before descending gracefully and nosing her hull into the sea. The plane lands astern of the lifeboat—"pulling boat" it is called—and taxies up slowly toward that craft which is headed into the wind. Just as the plane reaches a position close to the pulling boat the pilot cuts his engines. Simultaneously a mechanic in the bow of the plane heaves a line to the lifeboat whose oarsmen continue to head that pulling boat into the wind. The line is made fast to the boat; the crewman in the plane pulls hard on the line which action supplements the work of the oarsmen in shortening the distance between boat and seaplane. This is continued until the bow of the plane and the stern of the boat are brought as close together as possible. Great care has to be exercised that boat and plane do not bounce together in the heavy seaway as such a collision may badly damage the seaplane.

An actual rescue scene (above) shows the injured man being lifted aboard the ship.

An ailing seaman (in nose of lifeboat) is rowed to the waiting Coast Guard plane.

It takes clever maneuvering and adept jockeying to bring the two craft together for the transfer of the patient when the sea is rough and rolling. Not infrequently those in the plane cannot even see the lifeboat as both are caught in the trough of a high wave. If the patient is helpless or partly unconscious he is strapped in a special safety litter devised by the Coast Guard. It has a duralumin frame padded with a kapok mattress that serves as a life preserver in case the stretcher and patient are accidentally dropped into the water during the transfer—a happening, however, which rarely, if ever, occurs. The stretcher and sick person are passed gently yet as quickly as may be from the boat through a hatch into the body of the seaplane. Then the boat pulls away toward the ship and

Special metal stretchers have been developed expressly for the Coast Guard.

Especially designed for Coast Guard work, this Hall PH-1 is the first of six for the service. Range is 2,000 miles, it carries 20 passengers, develops 1,700 h.p.

the plane ascends from the water and begins the flight back to the base station.

This system of transfer was developed by the Coast Guard after a long series of practical tests during which every known expedient and possibility were tried out. Customarily the pilot after circling the ship on arrival at the rendezvous goes down wind from the ship at least two to three miles before landing. He slows the plane to approximately five knots above stalling speed and drags the water for about a mile before he sets the plane down. That maneuvering gives him ample opportunity to get the feel of the plane at low altitude and also to determine exactly how rough the water is. Waves occur in sequences of three, as you may know, the first two of about similar size followed by the third one, the big roller is of maximum periodicity and intensity. The pilot studies the period of these waves and sets his ship down at the identical split second when the bow of the seaplane is above the wave of greatest period.

One morning not so long ago Lieut. W. B. Scheibel received a call at the Dinner Key Coast Guard base from the superintendent of the Overseas Highway construction. Mate Copeland of the fishing boat *Loucie* had been brought ashore terribly burned over the entire body, face, legs and hands by a gasoline explosion. The previous night while the *Loucie* had been anchored southeast of Marathon, Florida, and the two occupants were asleep the boat had keeled over on her side when the tide ran out, spilling gasoline from full tanks into her bilges. Probably a tool then fell across the battery terminals, causing a spark which ignited the gasoline. The boat was completely destroyed. The two occupants rolled overboard and swam to shallow water where Copeland, critically burned, stood and suffered for 12 hours before being picked up by a passing yacht and transported to the construction camp.

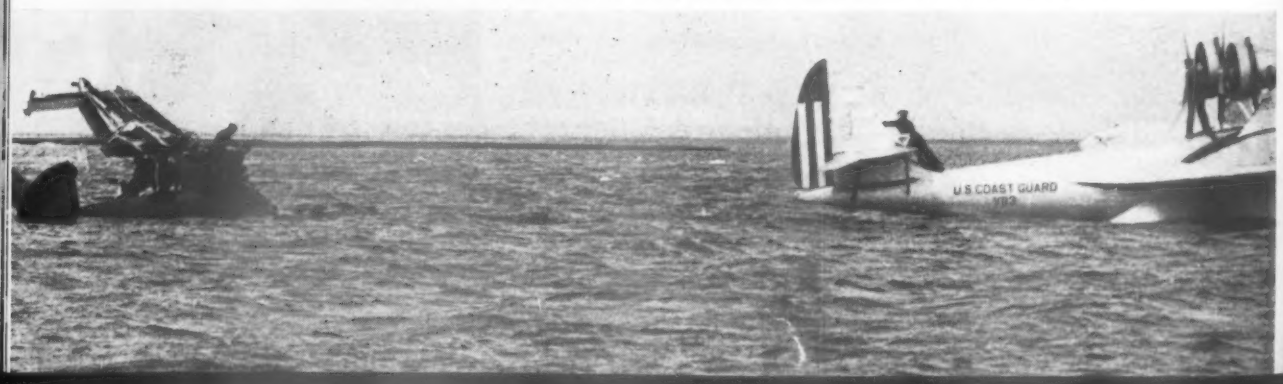
Three minutes after the emergency call was received Lieutenant Scheibel had manned and launched his seaplane which covered the 102 miles down the coast in 60 minutes, including landing time. The burned man was transferred as fast as the amphibian could travel to a Miami hospital. Joking with his Coast Guard rescuers he displayed a similar fortitude and courage in his agony and suffering to that of the flyers who brave every danger and endure extreme hardships in saving such as Mate Copeland from death.

On the official Coast Guard log another flight of Lieutenant Scheibel was recorded by the commanding officer as an "outstanding performance." A seaman on the ship *Trail Blazer* was reported seriously ill with a high fever and excruciating abdominal pains. The only possible meeting place where a Coast Guard seaplane could contact the ship for a transfer was on the north side of Chokoloskee Island where landing facilities were bad even under the most auspicious weather conditions. The sky was overcast as the pilot ascended and raced his plane at an air speed of 132 knots in an effort to reach the rendezvous before dark, a distance of 78 miles. The storm broke and inky blackness enveloped the sea before the big amphibian reached the appointed spot. Brilliant lightning flashes aided the landing. The lieutenant had to set his ship down on gale-swept infuriated waters where mud flats and innumerable fish stakes complicated the landing. An exceptionally rapid transfer of the sick man was made from boat to plane in only five minutes. Wind gusts, fish stakes, mud flats and complete darkness menaced the takeoff from the turbulent sea. In spite of all these handicaps Lieutenant Scheibel ascended successfully and flew with only his instruments to guide him on a southeasterly course out of the path of bad weather. Thirty-five minutes after the takeoff from the island vicinity the seaplane dipped towards its home hangar. An ambulance rushed the suffering sailor to the hospital where an emergency operation ridded him of his appendix just before it ruptured.

There's a commercial shark fishing station at Hollywood, Florida, whose specialty is the recovery and distribution of shark liver oil said to be much richer in vitamins than cod liver oil. On request from the owner of this establishment the Coast Guard pilots report to him about any schools of sharks which they observe during their daily patrol flights. Not so long ago, however, the tables were reversed; the federal flyers were searching for one of the shark boats instead of sharks; the boat had turned up missing with its crew of two men at the end of a fishing day. One Coast Guard plane from Miami and another from Charleston, South Carolina, scouted the shark-fishing waters for the next four days from dawn to dark, covering a total area of 47,000 square miles. The areas of drift were covered thoroughly once and in some cases twice. No trace of either the boat or its occu-

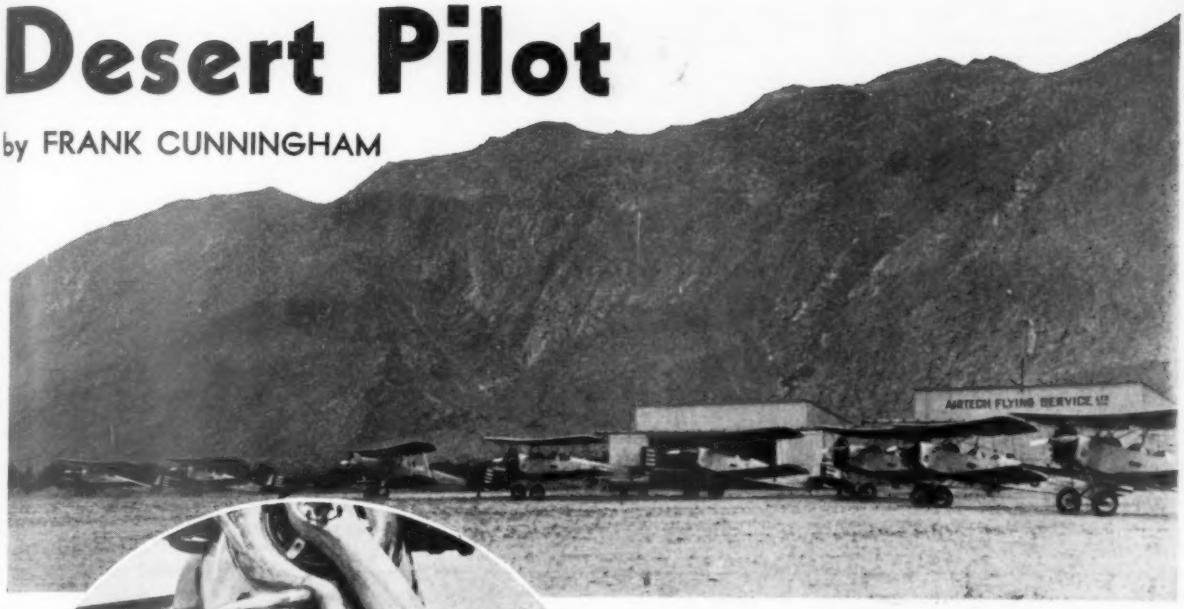
(*Continued on page* 84)

This Coast Guard pilot happened to see the ship at left crash, landed and rescued five passengers.



Desert Pilot

by FRANK CUNNINGHAM



Here is an ambitious young pilot who drove out into California's desert to take over an airport that had failed. Today the Palm Springs field is an up-and-coming air center.

Parrish (center) has helped Amos (left) and Andy polish up their flying technique. The ship in the picture at right is Parrish's low-winged sport trainer.

FOUR centuries ago the wind-swirled banners of Castile moved northward out of Spanish Mexico over the soldiers and explorers under the command of Cabrillo, Alarcon, and Coronado to the fabled land that lay beyond the horizon. For somewhere beyond where Spanish might ruled lay the Seven Cities of Cibola. As the ancients dreamed of finding the Isles of the West, the sun-browned Spanish sought the famed cities of gold.

Had those Spanish found mythical Cibola, supposedly situated in what is now the Colorado Desert, they wouldn't have rated a mention in this feature. The reason they are getting a notice is that they *didn't* find any fabulous cities. All they found were the adobe pueblos of the southwestern Indians.

Even as the *conquistadores* went forth to seek a fantasy land, so did one—A. R. "Gus" Parrish—an aviation instructor with a vision for the future—six years ago move southward from the state of Washington to Palm Springs in the Colorado Desert. This modern *conquistador,* the new manager-leaseholder of the Palm Springs airport, found a sight that to his eyes was as heart-rending as the pueblos were to the pike bearers of Castile—ramshackle hangars and desert conquered runways. . . .

A young, black-haired man of medium build leaned back in his chair in his attractive cottage on the flower-flecked desert at Palm Springs. Overhead the roar of a plane brought a smile to his face.

"Sounds like good business," I said.

"It is," he replied somewhat confidently.

Yes, the adventurer from Washington who invested his savings in an airport and found a junk pile, and the successful man seated in his own home in the desert community, are one and the same man. He's Gus Parrish and he has rebuilt his ruins of six years ago into a business that is growing steadily.

Let us leave the present-day Parrish, though, and jump back to 1929 when wings filled the air over the old Muller-Harkins field in Tacoma, Washington. Two men loiter near the main runway. One is Parrish and he is all eyes for a lad who roars his ship along the runway for a perfect takeoff. Gus turned to a companion and said: "Imagine that guy flying an airplane! And me selling Fords!"

So it was that the sight of a high school acquaintance piloting a ship changed the Chehalis, Washington, youth from an automobile salesman to a place in the aviation field. Gus soloed after 4½ hours in the air. When he had absorbed all the knowledge offered in Tacoma aviation circles, he went to Los Angeles to the Standard Flying School, first as a student and then as a pilot. Like most young men, Parrish wanted to go into business for himself and when a Cycloplane franchise was open, Gus took it and moved back to the Muller-Harkins field.

The Cycloplane was one of those oddities that help make up aviation's history. The company's basic trainer was a ship that never left the ground, but which taught the student the feel of the controls as it sped about the field. Another model actually left the ground, but it was so regulated that the student could only fly a few feet off the field during his early attempts at maneuvering. Student instruction was made as safe as possible, but unfortunately the light Cycloplanes weren't rugged enough to stand the power of the engine and the erratic controls of the student flyers. All too soon, they ripped themselves apart.

For one year Parrish and his Cycloplanes stood the gaff, then the small ships collapsed. Gus' ability to handle students then got him a place as an instructor in charge of ground school for the Washington Air College in Tacoma.

Then, on the morning of September 13, 1932, a telegram arrived at the Parrish household. (Oh, yes, like other young men he had added the responsibilities of a wife.) On September 15, 1932, a travel weary couple in a sand streaked car rolled into Palm Springs.

As Gus sought the airport that had as a backdrop gigantic San Jacinto surging 10,805 feet in the air, he recalled the message that brought him to Palm Springs, a message offering him a lease on the airport. The wonderful prospects reviewed in the telegram had lured practically all of Parrish's money.

The airport came into view. It was then that Gus Parrish found himself in the same spot as the Spanish who found the pueblos instead of Cibola. The Palm Springs air field was a series of distorted angles caught by the night light. Hangar doors hung precariously on broken hinges, the desert wind tousled the sand and spewed it through broken windows. The field was covered with shrubs and flowers but there was no runway in sight.

Gus did the sensible thing. He went back to town and went to bed. After all, the night has a way of distorting reality. In the morning he would find the real situation.

Parrish laughs when he talks about the next morning. "It was then," he remarked, "that I found out the night had shown me the real condition of the field. If I thought affairs at the airport were bad, I really had a jolt coming to me when I called on the town's business people. The former operators owed for food, the gasoline, for laundry —and had even borrowed heavily against the Waco KNF that the airport was supposed to own. The Palm Springs airport was the Palm Springs Joke!"

Never let it be said that Gus Parrish can't take a joke. The Spanish left the pueblo "cities," returned to Mexico. Gus didn't have any land to which to retreat. He got himself a partner—Bob Ridell, a young pilot—and started to rehabilitate the field.

"Half of business is that, no matter how old your equipment, keep it in good condition," Gus told me. "I called on all the business leaders, convinced them I was really going to put the field across. That is, if they would give me credit. Enough of them did believe me that I ordered material to repair the hangars, filled the gasoline tanks, put the landing field in fair condition.

"The improved appearance of the airport soon showed results. Guests from the hotels began to come down to the field. Renewed activity bred interest in aviation and soon we began to get students. Most of these students were guests of the hotels, older people who had the time and the money to devote to flying. Here I found a new problem. Formerly I had handled youngsters. Even though these kids were often quick to learn, I had been equally quick to criticize when progress wasn't as fast as I thought it should have been. With the older people 'bulldozing' methods were not practical. I had to see their point of view as well as mine. Gradually I grew to be patient with my students and I realized I was turning out better pilots. I learned that one can get more lasting results by 'going along' with a student rather than driving him."

With no aid from the government, city officials, or Indians (the airport is on an Indian reservation), Parrish and his partner made the airport turn the corner of prosperity. Mild prosperity to be sure, but still a remarkable achievement.

But in June of 1934 Bob Ridell, flying a passenger-student over North Hollywood, crashed and both occupants of the ship were killed. The accident brought additional financial responsibilities to the airport, wiped out all the accumulated profit. Financially Parrish was back where he had started when he came to Palm Springs in 1932.

". . . . . That one wasn't so good either, boss!"

He learned shortly after the crash that the possibilities of the airport had attracted other eyes. Money was offered him to enable him to recoup. Hard-pressed as he was, Parrish realized if he took in new capital he would lose control of the field. Eventually he would be back working for someone or quite likely find himself completely frozen out.

The money was refused. Sometimes even now Gus cannot realize how he pulled through the struggling months that followed the accident. His policy of treating the famous and the run-of-the-mine pilots equally had won him the friendship of the airmen. His fight to keep his credit good had brought him the respect of the commercial houses. His ability to train students was remembered by the hotel people. Some fusion of all these elements was the alchemy that kept the 160 acre airport *his* airport.

Today there are four hangars at the field. From a top of 600 transient planes in the successful early days before Gus took over the field, the register shows that, in 1938, Gus handled over 1,500 ships. The 500 by 3,200 feet runway is far more than adequate and Palm

(*Continued on page* 70)

THE Man UNDER THE Hood

WITH due reverence, we present this story about **Pope Pius XII** . . . it's never been printed before and we've just got to tell it . . . he still was **Cardinal Pacelli** at the time of his visit to the United States a few years ago . . . **His Excellency** chartered a **United Air Lines** Boeing for himself and his party . . . they flew between 7,000 and 8,000 miles during that visit . . . but our story concerns that ship's arrival in St. Paul, Minnesota . . . **Cardinal Pacelli** had voiced an objection, to the stewardess, over the paper forks and spoons with which he had been served . . . as the St. Paul stop was overnight, the pilot, co-pilot, stewardess and several other airline people retired to The Covered Wagon, a St. Paul night club locally famous for its steaks . . . during the evening, the stewardess mentioned **Cardinal Pacelli's** complaint . . . those in the party decided to be helpful and helped themselves to an assortment of the night club's silverware . . . the utensils were put aboard the airplane next day and were used by the papal dignitaries throughout the remainder of the trip . . . following the party's return to **Rome**, the airliner's crew returned the borrowed silverware to the unsuspecting night club . . . this, incidentally, is the first that even The Covered Wagon has heard of it . . .

Pope Pius XII

* * *

Randolph and **Kelly** Fields will be receiving their first groups of civilian students about the time you read this . . . a class of approximately 70 flight instructors from 16 of the best civilian flying schools is to take a special "instructor's course" . . . this will launch the **Army's** new flight training program in which some 2,000 new cadets are to go through the **Army** training center within the next 24 months . . . the instructors will get a course calculated to perfect them in training students in the Army fashion through the "primary stage" . . . this primary training will be finished at the civilian schools . . . and the survivors will go to **Randolph** and **Kelly** for training in the basic and advanced stages.

* * *

Here's a little dope on the **Boeing** Clippers . . . they're actually faster than **Pan American** and the **Boeing** engineers hoped they'd be . . . for top speed they don't quite reach 200 m.p.h. . . . cruising (high-powered cruising at 62 per cent total power) at about 745 h.p. per engine—comparable to the normal cruising output of airliners flying over domestic airways—they will move at 140 knots or about 161 m.p.h. . . . but for their long range service they will be cruised at only 43 per cent power, (516 hp. per engine) and will make 136 knots or 156 m.p.h. . . . this is lots better than the **Martin** Clippers (*China Clipper* class) on the Pacific . . . the Martins are cruised at 109 knots or 126 m.p.h.

* * *

Roscoe Turner is with the **Porterfield** company at Kansas City as a vice-president . . . and an officer of the company told us the other day that they were going to branch out from the field of the light airplane and begin building pursuit airplanes for the **Army** and export fields . . . **Roscoe** is sales engineer.

* * *

The airliner was letting down for a landing at Billings, Montana . . . everything went well until the co-pilot tried to lower the landing gear . . . it moved only slightly . . . the pilot pulled up hurriedly and flew around while they sought the trouble . . . the hydraulic fluid line was found to have leaked almost dry . . . the pilot radioed the trouble to the ground . . . he was ordered to try the emergency bottle of fluid for just such an occasion . . . he did . . . still the gear hardly budged . . . back in the cabin the co-pilot rounded up all the water, milk and even a pint of whiskey from a passenger's suitcase . . . the gear lowered perceptibly —but still it wasn't enough for a safe landing . . . everyone had visions of a forced belly-landing . . . suddenly the ground officials radioed the pilot: "How many passengers have you?" . . . the pilot answered: "Five" . . . the ground operator came right back: "Well, use 'em!" . . . the subsequent landing was uneventful . . .

* * *

Milo Burcham, the ex-stunt pilot turned Lockheed test pilot, is over in England and will be for two years, we hear . . . he's supervising the assembly of the 200 **Lockheed** *Hudsons* (converted "14"s) over there . . . we hear rumors that **New Zealand is getting some new Lockheeds too** . . . and that **Milo** may head for that land "down under" as soon as his work in England is finished. . . .

Burcham

* * *

Those "gay geographies" **United Air Lines** has had aboard its ships recently haven't worked out so well . . . passengers have objected, we understand . . . so, although that project cost the airline about $15,000, there will be no more gay geographies aboard United Airliners. . . .

* * *

After all the fuss and feathers we're told that the country's big airlines and one big foreign line are going to buy a lot of DC-4s after all . . . some of the newspapers had printed items last December telling that the DC-4 was ahead of its time in relation to traffic possibilities, and that the passenger business of the lines didn't justify buying such big planes at this time . . . all this has been changed by optimistic reports on a business upswing soon . . . **United, Eastern,** probably **Pan American** and **KLM**—the Dutch government airline—all are interested mightily in the DC-4 at this time . . . **KLM** is supposed to have ordered six, contingent upon similar orders from several U. S. airlines . . . we're betting that **TWA** will buy **Boeing** *Stratoliners,* now that an agreement has been reached with the **Boeing** company outside court . . . Incidentally, we heard the other day that the DC-4 was dived from 17,000 to 9,000 feet on a test hop and was said to have clocked 400 m.p.h. during that plunge! . . .

* * *

Benny Howard, in case you don't already know it, has left the employ of **United Air Lines** for a while . . . he's now with the **Douglas** company in somewhat the same job as that held by the late **Johnny Cable** who was killed in that "secret" bomber that was found to be carrying a Frenchman . . . **Benny has** been doing most of the flying on the DC-4 these days . . . so far as we know, he'll continue to head his little aircraft manufacturing plant in Chicago.

Howard

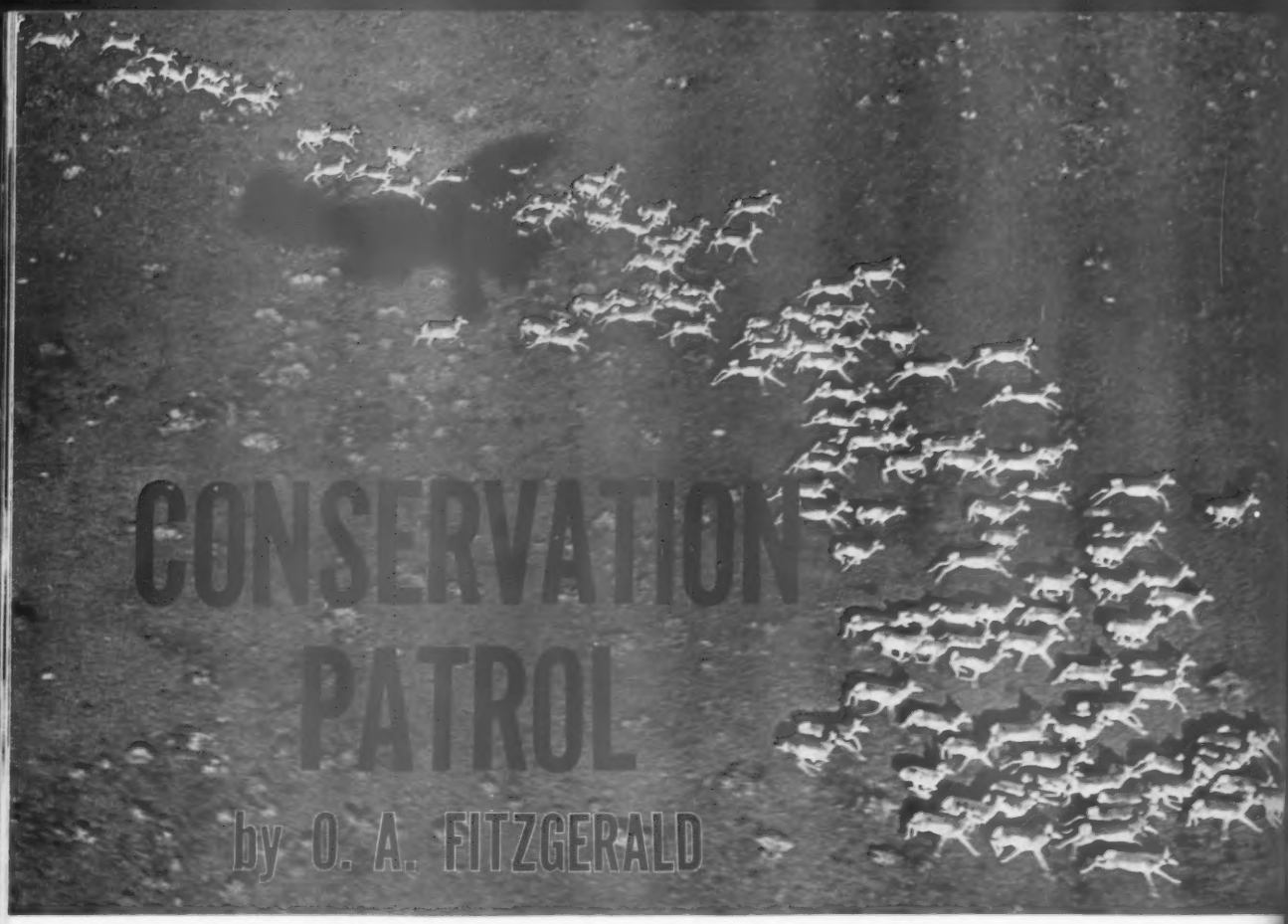
* * *

We hear all sorts of startling things from time to time . . . but this one's especially good . . . some big **Army** airplane was said to be flying in the vicinity of Chanute Field near Rantoul, Illinois, not long ago when one of its engines suddenly developed trouble and shook loose from the ship . . . the way we heard it, the ship got down okay . . . but the big story involves the engine . . . several passing men had to be recruited by **Army** officers (who managed to locate the dropped engine) in order to help lift it aboard a large truck . . . according to our information, that engine weighed close to two tons, was an air-cooled radial, and was supposed to develop about 3,000 h.p.! . . . which is *some* engine! . . .

* * *

That six-engined bomber that is such a hush-hush project on the west coast

(*Continued on page* 78)



CONSERVATION PATROL

by O. A. FITZGERALD

Charley Belden snapped this frightened herd from the plane whose shadow is seen above.

THE dense underbrush of the Canadian north woods is so terrible to go through even scientists named it "horridum"—*Echinopanax horridum.* Woodsmen call it Devil's Club. Well named, indeed!

"It is called Devil's Club because of its habit of slapping you in the face as you try to crawl through it and, as the branches carry thorns, the results speak for themselves," relates A. G. Macdonald of Canadian Airways.

Gathering facts on the private lives of the Canadian salmon following spawning no longer means miles of painful slogging and cutting—and cussing—through this fiendish brush. Salmon census takers fly over it. Instead of thinking about thorns and bleeding faces they enjoy the beauty of an ever-changing air panorama over a magnificent land.

Surveys are made because the salmon is a queer fish, a rigid creature of habit. After four or five years in salt water they return to their birthplace to spawn and die. By getting information in the fall on where the heaviest spawn is deposited and how it is developing the fisheries are able to forecast when and where future big runs will come.

Flying census takers alight on a lake, inspect the streams emptying into it, climb back into their ship and hop over the brush to another. From the air these facts on future runs can be pleasantly gained in but a fraction of the time that once was required.

Last spring, when Percy Melis, game management specialist for the Forest Service at Missoula, Montana; Leo K. Couch of the wildlife surveys division of the Biological Survey; and A. B. Hatch of the Idaho School of Forestry wanted to check on the welfare of the big Selway elk herd on the Clearwater headwaters in Idaho they climbed into Bob Johnson's tri-motor at Missoula about 10 o'clock in the morning. Trees were leaving out, flowers were blooming as they left the Bitterroot valley. Beyond the mountains on the Idaho-Montana border the scene changed; the elk country still was tightly held by winter.

Landing at the Moose Creek ranger station, they took a three hour horseback trip to the Bloom elk licks. They also flew over the Wounded Doe licks, another big elk gathering area, then along the west side of the Bitterroots, crossing back over the mountains into Montana near Lolo Pass where Lewis and Clark blazed the white man's first trail into the Oregon Country nearly a century and a half ago. Back to Missoula in time for dinner, 150 miles of flying behind them, they had secured a complete sky picture of conditions involving one of the largest elk herds in the United States.

"Without a plane at least two weeks would have been required to learn as much about spring range conditions, game concentrations and welfare as we got in those few hours of flying," Hatch commented.

From the Arctic Circle to the Gulf of Mexico airplanes are making a greater contribution in wildlife propagation, conservation, management, and to the convenience of sportsmen than most of us realize. They have been, for example, helpful in bringing back our ducks. And as those bigger flocks wing south planes shoo them off farms to protect the crops.

In both Canada and Alaska airplane fish planting has become a standard practice in stocking lakes in the back country. In California farmers hire pilots to chase blackbirds and mudhens off fields producing crops with an extremely high value per acre, such as lettuce and rice. Food has been dropped to concentrated bunches of snowbound wildlife. Along the Pacific Coast planes have practically ended illegal salmon fishing.

Sportsmen in Colorado used a plane effectively in a drive against crows, one of the worst predators. The plane swooped over the crow nesting place, putting thousands to flight. As the surprised crows filled the air a hundred sportsmen with shotguns made a big haul. Stockmen employed airplane gunners to hunt eagles, which have a definite weakness for tender lamb and apparently for young mountain goat and sheep, until this activity brought

Pilots like that at right are hired to drop grain and salt to hungry wildlife.

strong protests from people who thought it wrong to disturb the eagles. It should be pointed out that the eagle they sent planes after was the Golden Eagle and not the Bald Eagle of the national emblem.

Winter game counts are being made by plane, producing data necessary in game management programs. Airplanes in Canada haul fish and fur out of the interior country. They even haul dog teams around in Canada by plane. Last year Idaho's game department scattered salt on the big game ranges by plane. The airplane coyote hunter is one of the key figures in the persistent drive against this predator. Sportsmen everywhere are taking to the air to get to choice fishing and hunting country far from modern highways.

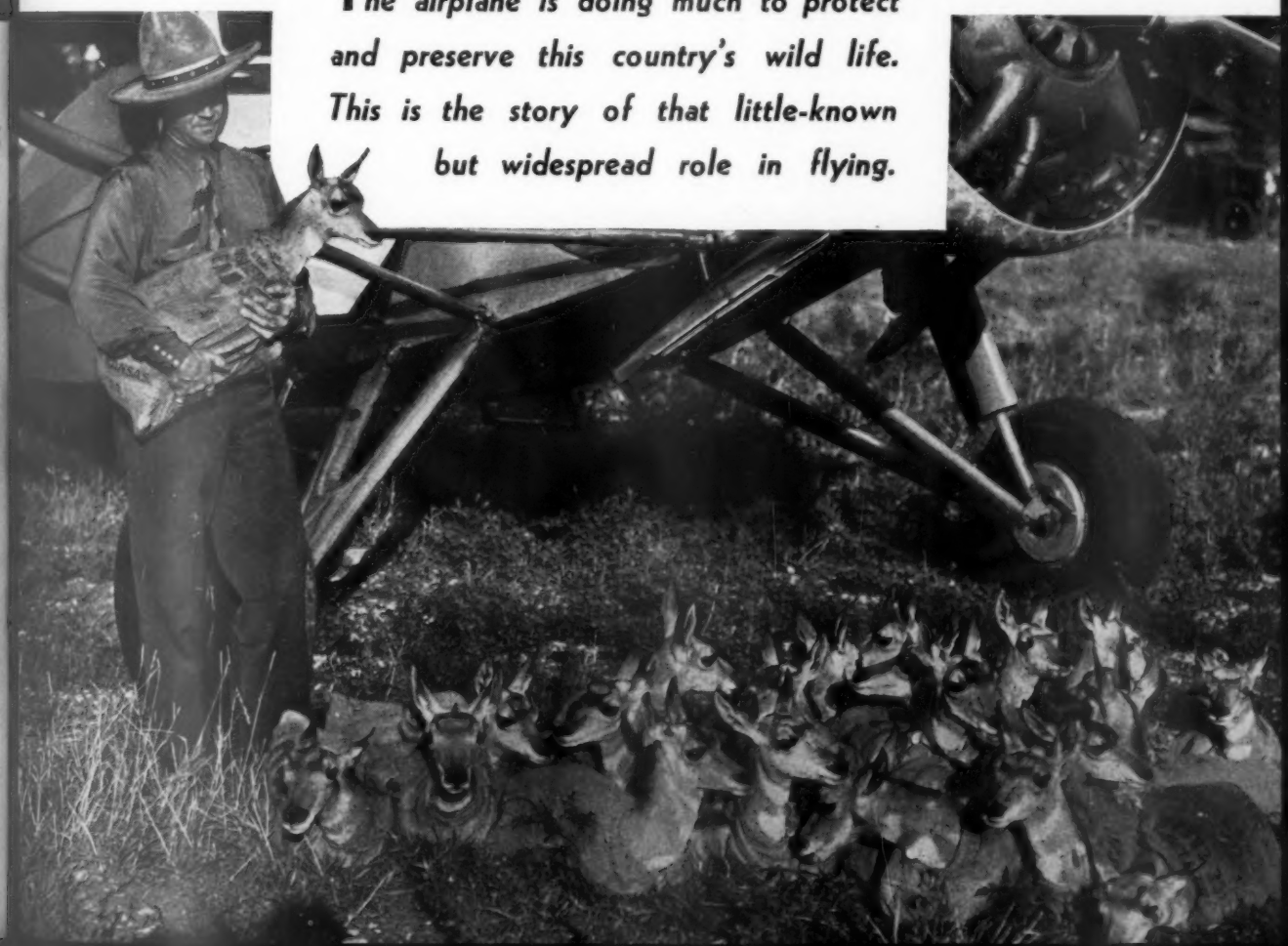
When sportsmen realized a few years ago that unless something was done immediately waterfowl might follow the passenger pigeon to extinction, everyone recognized that within the provinces of Canada lay the fundamental solution. Data pertaining to those great duck producing areas were scant.

"More Game Birds in America," a wildlife restoration organization, saw how widely airplanes were being used by prospectors, trappers, surveyors, in Canada. So the duck surveyors also decided to take to the air. In the summer of 1935, seven planes surveyed about 762,000 square miles in Canada and 233,000 square miles in this country. A thousand airviews were taken for study to determine what breeding marshes could be restored from the effects of drought with the least cost and effort. This was the first big and important survey of these enormous breeding areas.

Seven planes, flying 15,000 miles, secured in one year a picture that would have taken many years to gather on the ground. Duck restoration began immediately and has already produced dividends —more ducks. Since then airplane duck surveys have become annual. Last year planes flew nearly 10,000 miles for Ducks Unlimited (Canada). These surveys also are becoming quite common in this country and have proved themselves invaluable.

During the annual waterfowl survey in this country the Biological Survey draws on all possible aircraft, planes, autogiros and blimps from the Army, Navy, Coast Guard and private concerns.

The airplane is doing much to protect and preserve this country's wild life. This is the story of that little-known but widespread role in flying.



Although it's illegal in most states, harassed farmers have hunted hawks in planes.

Two staff members of the Survey have their own planes. This census covers the Atlantic Coast and waterfowl concentration areas in the Gulf of Mexico.

On their southern flight millions of ducks land in southern California. They arrive about the time rice fields begin to ripen. An ordinary sized flock of ducks can clean out several hundred dollars' worth of rice overnight. Geese also like farm fields. Rice growers must be on the alert to keep flocks from spending the night in their fields. Many growers, like Ben Garland of Willows, hire planes to chase the ducks away. Garland says airplane duck chasing has saved him thousands of dollars.

Rangers who hibernate in some of the national forests on game protection and winter wildlife study no longer are surprised when planes fly over in the middle of winter. Actually they would begin to worry if those planes didn't come, for their winter food supplies are dropped from the skies. Since winter is the crucial period in the wildlife cycle many rangers stay in the forests to gather information.

Over the oldest national forest in the world, the Shoshone in Wyoming, established by President Harrison in 1891, fly two of the most colorful of these wildlife pilots. Bill Monday, Wyoming's cowboy pilot, runs the ship and Charles Belden, known the world over for his livestock and wildlife photography, does the observing. Belden wouldn't feel or look natural without his camera, so while Monday operates the plane Belden operates his camera. When they see a band of elk or deer the plane nose dives and Belden snaps a picture, which Forest Service people study in the comforts of their offices.

In the Ochoco national forest of Oregon, Ranger Eldon Ball last year rented a small monoplane and flew at about 50 m.p.h. at an altitude of 500 feet, covering 125 miles over winter deer range in central Oregon. In this open pine and juniper country, with no underbrush higher than sage, he was able to count deer easily. They congregate in bands of from five to a hundred. Ball concluded that in this kind of country remarkably accurate counts can be secured by plane. Greater difficulty has been encountered in rougher and heavier timbered country.

Because Belden is an air-minded stockman many parks are able to display pronghorn antelope, one of the most picturesque inhabitants of the western plains. Five thousand pronghorns, the biggest antelope herd in the world, make their home on Belden's 20,000 acre Pitchfork ranch in Wyoming. Because they are always raiding his hay fields and hay stacks Belden thinks they should be distributed.

He tried many ways to put this idea into operation. He trapped old ones but they died when he attempted to ship them. A timid creature, the antelope dies easily from fright. Elk, deer, mountain sheep, in fact most game animals, can be captured and shipped without difficulty, but not antelope. He caught young ones, tamed them until they were pets, but still they died when he tried to ship them.

Belden was ready to give up when he remembered about Bill Monday and his airplane, which did all sorts of jobs from chasing wild horses to locating lost sheep and lost sheepherders. To their surprise, the pronghorn proved a natural air traveler. Now antelope are flown all over the country to parks, zoos, and ranges which had none.

When Professor Cobbs of McGill University dropped some 10 and 11 inch trout in mesh bags over a waterfall about 90 feet high several years ago he laid the groundwork for airplane trout planting. Only one of the trout died. To B. W. Taylor and Gustave Prevost of the Canadian Department of Fisheries this was much more than an experiment. They visioned the possibility of airplane planting of fish in the countless Canadian lakes over which planes are always flying but which are not so easily reached on the ground.

In 1934 Prevost began devising a way to plant fish from a plane. In 1935 actual planting was done. By 1937 the method had been so perfected that the first big planting was made. In one flight 40,000 trout were transported 25 miles and liberated in their new home within 15 minutes after leaving the rearing pond. The trout were carried in 25 containers. The Canadians say that had ground planting been necessary 134 containers would have been required and at least 10 hours' time.

Although fish go out by plane packed almost like sardines they survive remarkably well, because Prevost has devised special carrying equipment which gives the fish frequent shots of oxygen. Advantage of the airplane system, with the oxygen supply, is that a large number

(*Continued on page* 68)

This stockman uses his airplane to check his herd as well as fly in ailing calves.

TRICYCLE PORTRAIT

Subject of another striking aerial photograph by Mike Roberts of San Francisco is this Waco 'N'.

Bob Burck, Jr. (left) airline traffic manager, hands Capt. Ross Knighton invitations to Texas mayors to attend Gatewood pioneer celebration. Burck rode pony express relay.

Joan Fortier of Hutchinson, Kas., took a black cat for a flight last Friday the 13th.

Personalities

Pilot Dick Merrill recently admitted he and Toby Wing, appropriately named movie actress, have been married for the past ten months.

Following the completion of Pan American's first flight from Treasure Island to Hawaii, Capt. W. D. Culbertson got a pineapple juice award.

Gilbert Clark, Vultee test pilot, recently returned from China, will go to Brazil.

Roger Crawford recently was named secretary-treasurer of California Flyers, Inc.

Gar Wood, speed boat king, now tours the country in his new Grumman amphibian.

This is Alex Henshaw's return to England after breaking record to Capetown and back.

For his recent mercy flight to Chile, Major C. V. Haynes (right) won the DFC.

Officers of new Harlow Aircraft company are, left to right, John C. Kelley, Jr., Max B. Harlow and J. B. Alexander.

Record-flyer Johnny Jones (with C. R. Smith, left, and O. M. Mosier, right) is being quietly groomed for American Airlines cockpits.

This view shows the striking similarity to the real "Seabird" amphibian.

A MODEL AMPHIBIAN

by PAUL W. LINDBERG
Model Editor and Designer.

To our reader-builders seeking the unusual, we offer an amphibian as this month's gas model. It is patterned after the Fleetwings.

A NUMBER of requests have been sent in for an amphibian gas model. After going through our files we ran across this particular design which we thought would make a very good gas model. This particular model is equipped with shock absorbing landing gear which may be retracted for seaplane work. We are sure you will find this model very interesting to build as well as to fly over week-ends. The model has been painted red with silver trim.

Construction of Fuselage.

This type of fuselage is built somewhat different than the conventional flying plane type. It will first be necessary to cut all the formers to exact size. The halves of fuselage formers are cemented together to receive all stringers as well as reinforcement members.

The motor nacelle is constructed somewhat similar to the fuselage. The cowl ring is turned up from solid balsa using stiff paper. Nacelle struts are made from $\frac{1}{16}$" O.D. piano wire faired with $\frac{1}{16}$" thick balsa. It is very important that these be securely tied into nacelle and fuselage.

Construction of Landing Gear.

We have gone to great detail in describing the landing gear on the plan. If one will study its construction very closely no trouble should be encountered here. Springs within shock struts may be made from ordinary piano wire wrapped around a nail. The model may be built with or without the retractable landing gear, depending upon your taste.

Construction of Elevator and Rudder.

The rudder and elevator both are constructed of the flat section type. No camber is built into them as we have found the former type very satisfactory. Build these upon a flat surface to prevent any warping.

Construction of Wings.

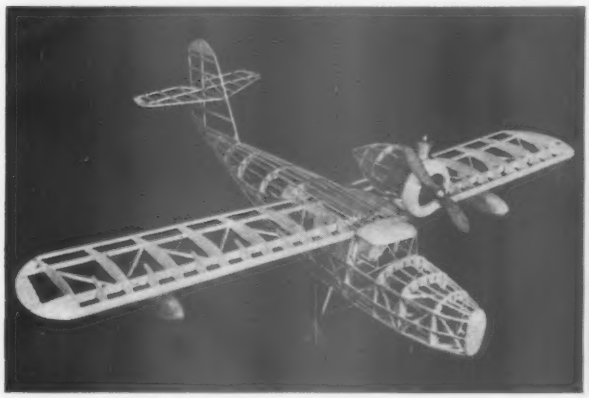
From 1/16" stock make all the wing ribs with the exception of the two root ribs which are $\frac{1}{8}$" in thickness. Take special precaution in shaping leading edge so that you obtain a very uniform edge. This will add greatly to the flying qualities. Do not omit any of the diagonal $\frac{1}{8}$" eqare compression members. Wing tips are also of $\frac{1}{8}$" sheet balsa.

Covering the Model.

In covering the fuselage of the model do not attempt to cover with too large pieces as this will only result in a poorly covered model. Cover only one section at a time for best results.

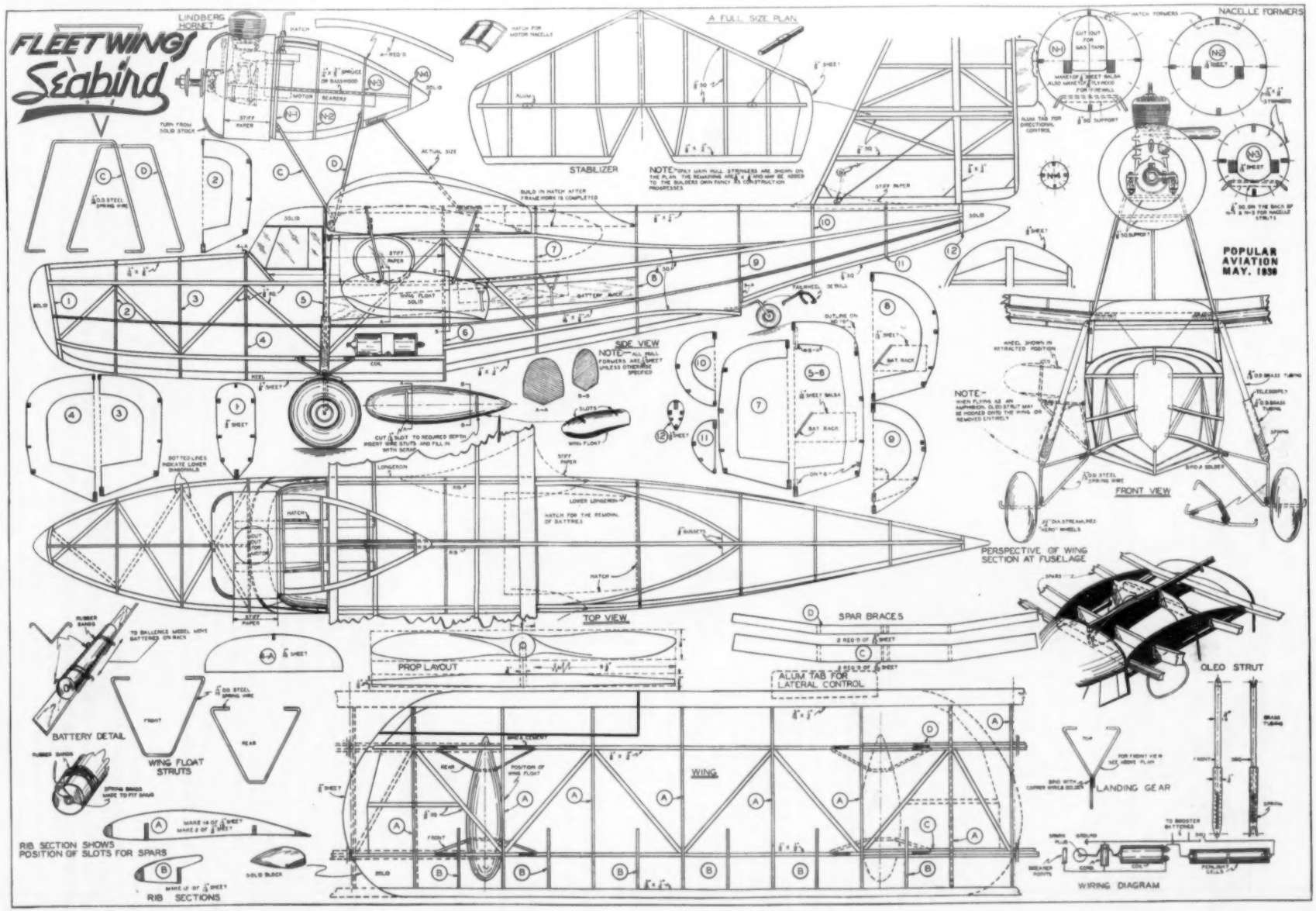
Wings and tail surfaces may be covered in large pieces as no irregular curves are encountered here. In order to secure the proper tautness of bamboo paper, spray with an ordinary insect gun or apply water with an ordinary brush. When applying with a brush be extremely careful so that you do not push the brush through the surface. After all parts have become thoroughly dry, apply coats of clear dope. Three coats should be enough with a light sanding between each coat.

(Continued on page 79.)



Although somewhat unusual, this model is worth extra effort.

This is the completed ship. Note "clean" engine nacelle.


FLEETWINGS
Seabird
LINDBERG HORNET
A FULL SIZE PLAN
STABILIZER
NOTE-ONLY MAIN HULL STRINGERS ARE SHOWN ON THE PLAN. THE REMAINING AREA 4 x 4 AND MAY BE ADDED TO THE BUILDERS OWN FANCY AS CONSTRUCTION PROGRESSES
SIDE VIEW
NOTE-ALL HULL FORMERS ARE SHEET UNLESS OTHERWISE SPECIFIED
TOP VIEW
NACELLE FORMERS
POPULAR AVIATION MAY, 1930
FRONT VIEW
NOTE-
PERSPECTIVE OF WING SECTION AT FUSELAGE
OLEO STRUT
SPAR BRACES
PROP LAYOUT
ALUM TAB FOR LATERAL CONTROL
WING
LANDING GEAR
BATTERY DETAIL
WING FLOAT STRUTS
RIB SECTION SHOWS POSITION OF SLOTS FOR SPARS
RIB SECTIONS
WIRING DIAGRAM

T. Claude Ryan—His Life Story

(*Continued from page* 15)

For practice, Wilson had been having Ryan taxi the plane around the field, opening the throttle about half-way, getting the tail up and holding it there until he came to the end of the field, then cutting the gun. After Ryan had made two or three trips back and forth, Al came out full of praise for his efforts and assured him that with a little more practice he could solo.

The embryo airman, however, decided it was now or never. So—"Here goes," he said to himself as he "poured the coal" to the crate, got the tail up and, pulling the stick back, soon found himself flying along solo at an altitude of 30 feet.

"Gee, it would be swell to take her up to a thousand feet," he thought, but by that time the end of the runway loomed up and Ryan decided to land. Having had no actual landing practice, Ryan dropped the ship in hard, the rubber shock cord let loose, and "bust" went the prop. Seventy-five dollars for repairs was more than the school could stand. That landing closed the school for good, but Ryan had made his solo flight—the only student to do so.

With a recommendation from the flying school—in spite of his unauthorized solo—and a background of some actual mechanical experience, Ryan again tried the Army, finally was granted a waiver for being under age and received an appointment as a cadet. That was in the spring of '18. Finally, late in the fall, he received notice to report to the recruiting station for duty. On arrival at the Army headquarters he received the stunning and unexpected blow that he was not needed for service. The date was November 11, 1918, and the Armistice had just been signed!

That unpredicted turn of events sent Ryan to seek additional technical training, and for a year he studied engineering at Oregon State College. But, on learning that the Army was going to start new flying cadet classes, he forwarded another application. This time he was accepted as a cadet and in the fall of 1919 reported to March Field for his first *real* flight training. Of a group of 75 cadets only 30 graduated from the 50-hour primary stage, while Ryan was one of three completing the course who received pursuit pilot ratings.

In the late spring of 1921, before the start of the hazardous forest fire season, the Forest Service made arrangements with the Army Air Corps to put in an aerial forest fire patrol covering Northern California and Oregon. It was decided to use the graduating March Field cadets for this service as it would provide invaluable training. Consequently, instead of going to Kelly Field for advanced training, Ryan volunteered to serve with the forest fire patrol and accordingly was assigned to Mather Field for 10 hours of training on Liberty DH's in preparation for beginning the patrol work.

Seven DH's of the 9th Aero Squadron were sent to Corning, in the Sacramento Valley, under command of Lt. John Morgan (now Major Morgan, executive officer of Randolph Field). Ryan was assigned to this group. Each pilot was in charge of his own plane, a mechanic and an enlisted observer who served as forest fire lookout and radio operator. Ryan, thinking he was pretty "hot" as a pilot, volunteered to take plane No. 13, which he flew throughout the season without incident.

Pilots went out every other day on a patrol of about 500 miles. Typical of the patrols was that flown by Ryan, whose usual route was northwest from Corning to the Oregon line, east to Montague where they stopped for lunch and gas, and return via Mt. Shasta—a course which required the DH to fly at nearly 10,000 feet, much of the way over heavily timbered mountains, with only two emergency fields provided. The planes were equipped for radio transmission, with arrangements made for amateur operators to act as receiving stations along the various patrol routes.

". . . and when we say our mechanics swarm over each airplane, we mean swarm . . ."

In spite of his number "13" De Havilland, Ryan never seemed to have any trouble, though the other pilots had frequent forced landings. Near the end of the season the Forest Service completed a number of emergency clearings in the forests, and it fell to Ryan's lot to give these fields their first landings to see if they were satisfactory. Ryan kept this up the remainder of the season without mishap rounding out his experience and whetting his skill considerably.

Finally, one day, Ryan's old number "13" did begin skipping beats when far out over the forests. Fortunately he was near a new emergency field at Orleans, an Indian village in the mountain wilds of the Klamath River, and this field came in mighty handy. It required three passes at the field before he could drop the plane in to a short landing, and much to the surprise of pilot and observer the landing gear didn't let go. To this day Ryan claims the landing at Orleans was the shortest he ever made.

With the end of the forest fire season, the squadron went back to Mather Field, Ryan staying there in active Army service until January, 1922. Returning to Southern California a seasoned pilot, Ryan tried to get a job in commercial flying but was unable to find any demand for pilots, nor in fact to find any commercial aviation.

For the next few months he worked for an auto supply company, but his heart was not there. To raise the necessary funds to start a business of his own in aviation, he sold his automobile, scrapped his savings account and went to Rockwell Field, San Diego, to fly on his Reserve commission. Then the time came when it was necessary for him to get that memorable shave and hair cut. . . .

Business those first few months on his own—at the improvised airport along the San Diego bay front—was pretty slim for Ryan. What little revenue there was barely took care of gas and oil for the Jenny. Finally a carnival came to town, setting up business right next to the field, but this brought him only a few passengers. However, one of the concessionaires became so enthused about flying that he went for a flight practically every day assuring Ryan, at least for a limited period, of a steady source of business.

When the carnival was ready to leave San Diego, the management asked Ryan to go along with his plane and fly passengers at the cities they visited, but after one poor paying stop he returned to San Diego. Business continued to be apathetic, so to reline his pocketbook Claude took a job as pilot with a barnstorming expedition and went down into northwestern Mexico. After several weeks, the owner insisted on the group going into a higher altitude area and attempting operation with the Jennies against the objections of Ryan and the other two American pilots. The result of that was a first and only crack-up for Ryan.

The local "General," whose weight must have topped 250 pounds, must be taken for a hop, the barnstorming tour owner insisted. It was Ryan's turn to hop passengers, and since jobs were scarce, he decided to make the flight anyway, against his better judgment. The poor over-loaded Jenny struggled into the air, rode an up-current to a thousand feet then, caught in a downdraft, soon was skidding along upside down on the heavy grass in a gully beside a railroad track.

Coming to a stop, Ryan hopped out and hastily made for the gas tank which was threatening to spout over the hot engine.

(*Continued on page* 66)

CUB *Goes* POST

CUB COUPE
CUB BRINGS FLYING COSTS DOWN-TO-EARTH!
Free Flying Course
Cub dealers are prepared to give every purchaser of a new Cub airplane a course of dual flying instruction in the purchaser's own plane, without charge. This free course is given by Government licensed instructors.
Free Flight Demonstration
Your Cub dealer will be glad to give you a free flight demonstration. This will reveal to you more emphatically than anything we can say why a third of all civilian airplanes being purchased are Cubs.
Free Catalog
Send today for colorful, illustrated Cub catalog, full details of the free flying course and name of your Cub dealer. Piper Aircraft Corporation, 14 Post Street, Lock Haven, Pa., U. S. A. . . . Cub Aircraft Co., Ltd., Copenhagen, Denmark and Cub Aircraft, Ltd., Hamilton, Canada.
THE NEW CUBS
YES, it's truly *easy* for you to enjoy the satisfaction of flying your own plane! For Cub, the pioneer low-cost private airplane, is now priced well within reach of the average man. Think of it—you can own a handsome, dependable, easy-to-fly Cub for as little as $1249 . . . on terms as low as
ONLY $419 DOWN
In addition to extra safety and long life, Cubs are famous for economy of operation . . . using as little as 3 gallons of gas per hour and practically no oil. Choose from these models: *Trainer*—2-place, tandem seating, 40 HP engine, $1249; *Trainer*—50 HP engine, $1298; *Sport*—2-place, tandem seating, 40 HP engine, $1499; *Coupe*—2-place, side-by-side seating, 60 HP engine, $1935; *Seaplanes* from $1944. Prices F.A.F. Lock Haven.
Visitors Welcome at the Cub Factory, Lock Haven, Pa.
COUNT THE CUBS
THE WORLD'S FASTEST SELLING AIRPLANE

THIS is important news to everyone interested in aviation—in private flying, selling and instructing. The Cub advertisement reproduced above in actual size appears in The Saturday Evening Post April 8 and another the same size May 6. Also half-pages in Popular Science in April and June and third-pages in Outdoor Life in April and May. This advertising by Cub in such national publications as the Post, with more than 3,000,000 copies per issue, should do much toward the promoting of private flying.

T. Claude Ryan—His Life Story

(*Continued from page 64*)

When rescue came from the pueblo Ryan, like the Dutch boy who held the dike, was plugging up the hole in the gas line with his finger. The poor general, though only shaken up, was too scared to move. That ended the Mexican barnstorming trip.

Returning to San Diego, Ryan decided that the hazard of taking off under high-powered electric wires, going between two poles which had been recently erected at the end of the runway and making a sharp turn to avoid the mast on a dredge was a bit too hazardous so he moved his operations further up the bay.

By this time he had two Jennies in service and to make the "Ryan Flying Company" airport appear very busy, was offering free space on the field to local pilots who had bought up some of the wartime planes. The resultant line-up of eight or nine ships was, for those days, quite impressive.

In 1923, when the government disposed of its wartime flying equipment, Ryan put in a bid for a few hundred dollars for six Standard biplanes and spare parts to be shipped from Texas. The planes arrived in terrible condition but Claude and his mechanics began to redesign and rebuild these two-place open cockpit planes into five-place cabin jobs, equipping them with 150 h.p. Hispano Suiza engines.

One day, late in 1923, a sightseeing bus stopped by Ryan airport and much to Claude's delight most of the bus passengers went for $5 hops in the Ryan-Standard cabin planes. Seeing the possibilities of a good thing, Ryan worked out a proposition with the sightseeing outfit to come in every trip. That was the start of a very lucrative business that lasted many years and, frequently, more than a hundred eastern sightseers would fly in a single day.

Along with his other activities, Ryan had also been training students to fly. One of them—B. F. Mahoney, a sportsman pilot of considerable means—suggested to Ryan that they go into business together operating a regular passenger plane every day between San Diego and Los Angeles. The round trip fare was established at $29.50 (it's $10.80 today) and the one-way, $17.50. They had figured the daily operating cost at $29.50 so that with only one round-trip passenger they would break even.

On March 1, 1925, to the accompaniment of the usual Hollywood opening, Ryan Airlines, Inc., flew the first schedules of the "Los Angeles-San Diego Air Line"—the first year 'round passenger airplane line operated on regular schedule in the United States.

Early in 1925, the first *Cloudster* plane built by Donald Douglas was purchased by Ryan for the airline. The ship then had three open cockpits, two capable of holding three people, while the pilot's cockpit held two more passengers. The plan was rebuilt in Ryan's shops as a cabin plane to accommodate 10 passengers, with a cockpit forward for pilot and mechanic or co-pilot. This was one of the first modern-type passenger airliner in this country and had passenger space almost as commodious as a present day Boeing 247D airliner. Even a modern-type loading ramp was used by the airline, surprisingly similar to today's.

That same year, Ryan saw the need for a medium-weight airplane of greater speed and carrying capacity than the De-Havilland biplanes which were being used by the Post Office for the airmail service. Knowing that the mail would soon be turned over to private contractors and that there would be a demand for suitable aircraft, the Ryan organization designed and built the Ryan M-1 plane, a high-wing monoplane, powered with a Hispano Suiza engine, capable of carrying an 800-pound load and cruising at 115 m.p.h. This was more that twice the load carried by the DH mail planes, which were powered with engines of double the horsepower. Soon the plant was turning out later versions including the M-2 and the *Bluebird*, the first Ryan cabin monoplane.

Vern C. Gorst, who had been awarded the Pacific Coast night air-mail contract, came to San Diego to look over the Ryan planes as possible mail carriers, at the same time taking flying instruction. Gorst wanted to be certain that the M-1 was the most suitable plane for the night air-mail run and accordingly contracted with Ryan to equip one of the planes with a Wright J-4 *Whirlwind* engine instead of the Hispano-Suiza which had been previously used. The first plane was then to be tested on the Los Angeles-Seattle run by Claude Ryan to prove the ship's superiority over other planes. Carrying an 800 pound cargo and flying most of the way at 10,000 feet, Ryan proceeded to Seattle with Gorst as passenger breaking many intercity speed records along the way.

So much publicity had been given the speedy new Ryan plane that some of the Army boys at the Vancouver, Washington, airport, doubting Ryan's performance claims, proposed a match race between the new M-1 and a special Army DH to be flown by Lieut. Oakley Kelly, at that time the Army's ace pilot because of his first non-stop flight across the country.

Ryan found to his surprise that on the appointed Sunday a large crowd had turned out and that a considerable wager had been placed on the outcome. The M-1 came through to win the race rather handily, much to the embarrassment of at least one Army general. After that, selling Ryan planes was a bit easier. During the first year of production 23 ships were sold, including seven for Pacific Air Transport, and others for Colorado Airways, Inc., and the Clifford Ball Airlines in Pennsylvania.

After the development of the *Bluebird* cabin plane, further design work was done on an advanced type cabin ship and in 1926 the first Ryan B-1 *Brougham* was built, powered with a Wright J-5 *Whirlwind* engine and, when completed, sold to Frank Hawks. Incidentally, much of the Ryan engineering work at this time, including that on the *Brougham* was being done on week-ends by Jack Northrop, the famous designer.

Before the close of the year, Ryan sold the manufacturing business to his partner B. F. Mahoney, but agreed to stay for a minimum of four months as manager. In January, 1927, there came to Ryan's desk a telegram from the Robertson Aircraft Corporation of St. Louis asking if the company could build a plane with a Wright *Whirlwind* J-5 engine, capable of making a non-stop flight from New York to Paris.

After brief engineering calculations had been made, a wire of confirmation was sent. The next day another telegram came back stating that "our pilot will arrive Wednesday." Accordingly, Charles Lindbergh made his appearance and the *Spirit of St. Louis* was built and successfully flown across the Atlantic to take its place in aviation history. Ryan left his active part in the management of the company about the time the *Spirit of St. Louis* was completed, as his agreed period of four months under the terms of he partnership dissolution specified.

There was then no radial air-cooled engine in this country in the same horsepower class as the widely used OX-5 water-cooled engine. Ryan consequently saw an excellent potential market for a satisfactory radial engine and therefore completed arrangements with the Siemens-Halske Co. of Germany for the five-year exclusive sales and manufacturing rights for Siemens engines in this country to be distributed under the name of Ryan-Siemens.

Within a few months, 17 manufacturers were using Ryan-Siemens engines, but deliveries from abroad being far behind schedule and the Siemens people having indicated that prices would be raised, Ryan saw the necessity for a trip to Europe. This seemed like an opportune time for an event he had long been looking forward to—combining a survey of European aviation with a honeymoon—so on February 18, 1928, Ryan was married to Gladys Bowen of San Diego and together they left for Germany. Now, to carry on in their father's footsteps are three boys — David, 9; Jerry, 7, and Stephen, aged two months.

When Ryan returned from Europe in 1928 he devoted his time to continuing the operation of the Ryan Flying School at San Diego. Flight instruction was given at the old Ryan airport, with ground school classes given in connection with the Pacific Technical University.

As Ryan now recalls the past 22 years of his career he agrees that with Lindbergh's flight, aviation became an industry—a business proposition. No longer does the president of an aviation company go barnstorming into Mexico or pilot a plane for an embryo wing-walker. Today's aviation executive is more concerned with sales, with engineering, with balance sheets and profit and loss statements.

So it was with the Ryan company. Since 1928 its history has been a record

(*Continued on page 68*)

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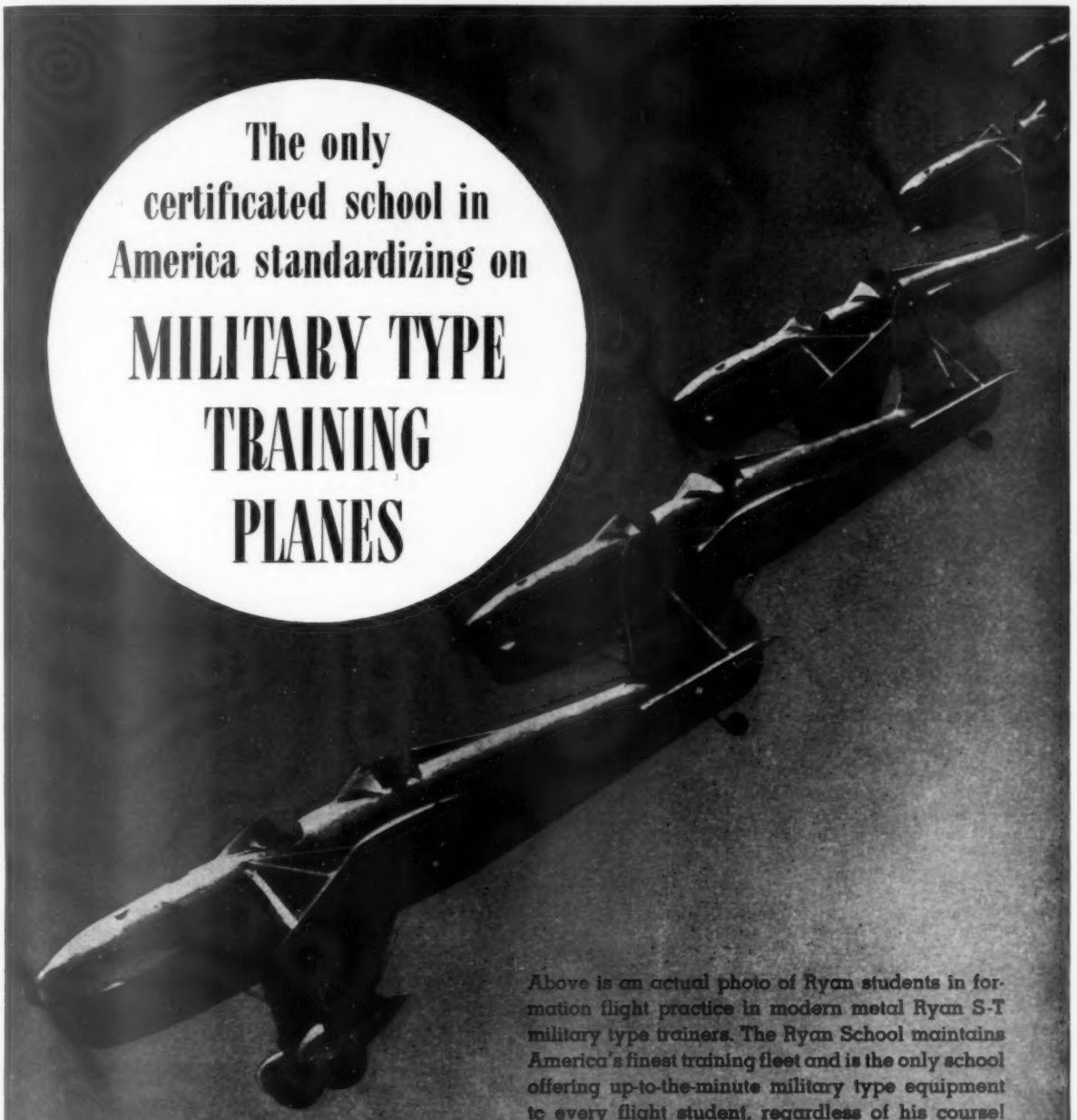

Above is an actual photo of Ryan students in formation flight practice in modern metal Ryan S-T military type trainers. The Ryan School maintains America's finest training fleet and is the only school offering up-to-the-minute military type equipment to every flight student, regardless of his course! Mail coupon for complete details.

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Conservation Patrol

(*Continued from page 58*)

of fish can be carried in a small volume of water.

Last summer the Frontier Club, an organization of sportsmen in fifteen southern Idaho counties, planted fish by plane, one lot at 100 feet and the other from 200 feet. Sportsmen, state, and county game officials filled a ring of boats in a shallow part of the lake. Lionel A. Dean, president of the Idaho Pilots Association, handled the ship, while O. A. Kelker, private pilot and Twin Falls newspaperman, dumped the fish within the ring of boats.

"There wasn't a single fish lost," relates J. W. Tingey, president of the sponsoring club. "Possibly three or four per cent were stunned when striking the water but revived within a few minutes. The balance swam away immediately." The boats remained on the scene for about an hour, looking for dead or injured fish.

Montana and Washington also are testing airplane planting. In Montana the fish and game commission dropped 5,000 fish of different species and sizes from planes flying from 100 to 1,000 feet. The results were so encouraging, says John W. Schofield, state superintendent of fisheries, that further work will be done to develop the most desirable method of dropping them.

Washington's fish and game department is interested in planes as a means of planting lakes which lie in deep canyons in the Cascades where a plane cannot get within a thousand feet of the water. Burlap cloth parachutes let the cans of fish fall slowly to the lake from as high as 2,000 feet. The experiment was done on an open lake so the fish could be retrieved immediately and put in holding bonds to check the effects of the fall. Few of the fish showed ill effects.

With the parachute the can descends slowly and with a slight swinging motion, relates Washington Director B. T. McCauley. A cedar slab was put in the bottom of each can. The buoyancy of this slab turns the can upside down in the water, allowing the fish to swim out. Where the plane can get within a hundred or two hundred feet of the water the fish are just dumped out.

The air-minded Alaska planes are carrying trout in the isolated country. This activity is stocking lakes which, because of high falls at the outlets, are fishless. "We plan to extend airplane planting very materially in Alaska this coming season," reports B. Frank Heintzleman, Regional Forester.

Salmon pirates no longer take advantage of the fact that from Alaska to Washington and Oregon the Pacific Coast is an ideal place to play "hide-and-seek" with law enforcement boats. From one inlet to the next may be only a few miles across by land but 60 to 80 miles around the point by water. For ten years Canada's air patrol has done a remarkable job curtailing the illegal salmon fisher. Until the salmon canneries put on their own aerial patrols they lost heavily from raided traps. Now the planes make such frequent flights over traps the illegal fisher never knows when a patrol plane will pop over the horizon, alight on the water alongside and crack down on him.

All flying in the commercial fishing industry isn't to curb illegal goings-on. Legal flying helped build the pilchard (sardines when they're in cans) industry in Oregon. Planes would take off from one of the coast lakes, fly out and patrol the sea between the 25-mile mark and the coast. Pilchards are visible from the air as they throw off a phosphorus gleam in the water. When the pilot locates a school he radios back to the base and fishing boats steam out to the spot designated. Some tried airplane scouting for salmon but found themselves in bad with the law; it's not legal.

Last summer thousands of pounds of salt were bombed—500 pounds a flight—on Idaho's summer deer and elk ranges. There is much interest in airplane salting as a means of reaching areas off the accessible pack train routes. Game management people regard salt as a "cheap cowboy." A big problem in elk and deer management is to keep the herds off their winter range during the summer months, so there will be more feed there for the winter. Airplane salting is being considered as the supplement, rather than the competitor, to the traditional method of hauling it in by pack train. Planes doubtless will find a permanent place in bombing salt in the more remote sections where pack strings ordinarily do not travel but where game herds are to be lured.

Sportsmen are decidedly interested in airplane coyote hunting. Sponsored mainly by the livestock interests, who have been warring on this predator for nearly half a century, coyote hunting is beneficial in restoring wildlife.

Two Idaho pilots, who have bagged about 500 coyotes, some for fun but mostly because they were paid to do it by stockmen, in the last two years, tell how it's done. They are Lamoine Stevens and Grant Kilbourne of Twin Falls. They fly about 100 to 200 feet over the ground until they spot a coyote. Then they get lined up behind him and when almost over him drop down to within 20 or 30 feet. While the pilot operates the plane his companion, in the rear seat, operates a shotgun.

Game management men pricked their ears at reports of the new helicopter developed in Germany. Driven by two three-bladed propellors, one on each side of the fuselage, it does things no other aircraft has been able to do. And those things are just what wildlife people have been wanting in the way of a flying machine.

It can rise straight off the ground for 10,000 feet, important because the ceiling of the autogiro is too low to permit their use in the rugged mountainous game areas. It can go forward 100 m.p.h., fly sideways, backwards, or hover over a spot like an eagle. It can come down or go up at a snail's pace.

A rotary-winged machine capable of doing the things credited to the European device would be ideal for wildlife flying over the roughest country, in which modern planes are handicapped. Suppose a band of elk were known to be on a hillside in clumbs of brush or trees, as is often the case. The ship could come right down over the tree tops, hover there until the animals were scared out. As they showed their heels to the intruder counting would be easy. Already the autogiro is being used in agriculture, in insect pest control work. The federal government has turned $2,000,000 into research in rotary-winged aircraft. Those who are interested in wildlife flying believe that in rotary-winged craft aviation will see its greatest development in this field of flying.

But whether the wildlife pilots of tomorrow ride in the same kind of planes that have turned in so many useful accomplishments in recent years or whether some new kind of a craft steals the show a continued growth in aerial activity in behalf of wildlife is certain.

END

T. Claude Ryan

(*Continued from page 66*)

of business development and progress with each forward step being taken only as the opportunities could justify. In 1931, the present Ryan Aeronautical Company was incorporated and a year later its training and aircraft sales activities moved to the company's present location on Lindbergh Field, San Diego's municipal airport. Ryan built new administration and school buildings and hangars in the very middle of the depression period, but sound and energetic management soon saw the company not only continuing to weather the depression but growing in an exceedingly healthy manner.

In the autumn of 1933 Ryan, together with Millard Boyd, now the company's chief engineer, designed and manufactured the first Ryan S-T metal-fuselaged monoplane. By June, 1934, the first S-T had received its Approved Type Certificate and was then extensively service tested for months. Early in 1935, Ryan S-T's were coming out of the busy Ryan factory on a production basis.

Few planes have won and held the popular approval and acceptance enjoyed by the Ryan S-T series of trainers. Now used widely throughout this country for sport flying, there are a large number of commercial operators and private pilots using them, while the air forces of many Latin American countries have turned to the Ryan STM military trainer for pilot training.

Late in 1937 the Ryan S-C metal cabin plane was developed as the first plane which in design, engineering and production took full advantage of metal construction features for the private-owner class of aircraft. Last year the company expanded its service to other aircraft builders by formation of the Ryan Contract Manufacturing Division which, by means of Ryan-developed processes, builds all types of specialized sheet metal aircraft stampings.

Which isn't bad, considering its barber-shop start.

END

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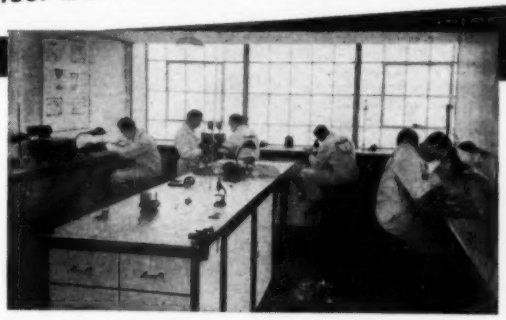

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Wooden Hangars

(*Continued from page 37*)

and purlins for a 60 x 60 foot building was 74.2 per cent of the most economical alternate in other materials, and for an 80 x 100 foot building the cost of timber connector construction was 52.8 per cent that of the most economical alternate.

One reason for their low construction cost is the fact that timber connector wood hangars lend themselves readily to fabrication by unskilled labor, and often utilize locally produced materials. The Burlington hangar discussed above was a relief project.

Relative fire hazard of different construction types appears to be a minor consideration among hangar builders, experience having demonstrated thoroughly that it is not the building but what is in it that leads to disaster. In structures such as hangars, the fire hazard is not due to any appreciable extent to the structural material itself, but to the contents or to external conditions to which the building is exposed. It is the nature of the contents which determines the rate of fire spread, once a fire is started. Where the contents are highly inflammable, fires generally spread through an entire building within a few minutes and temperature builds up rapidly. Where metal trusses are used, buildings frequently are rendered unsafe almost immediately because of the possible collapse of the unprotected metal.

An outstanding example of the fire safety of a lumber-built airplane hangar equipped with sprinklers was demonstrated at the U.S. Bureau of Standards. Seventeen fire tests were carried out consuming 40 Army airplanes and hundreds of gallons of gasoline and oil in the process. After the final fire test, in which four planes were placed in the hangar with tanks filled with 360 gallons of gasoline and 40 gallons of oil, and 15 gallons of gasoline spilled on the floor and ignited, the hangar was still in excellent condition, there being only two lightly charred places on the walls and roof.

Plans for timber connector hangars as well as for those of other materials are obtainable from the Civil Aeronautics Authority and information on the adaptation of the new construction system to special situations may be had from the National Lumber Manufacturers' Association, Washington, D. C.

END

Desert Pilot

(*Continued from page 54*)

Springs is an emergency landing field for major airlines.

Because of the nature of Palm Springs as a desert resort, people are drawn from all over the world to the mecca of sunshine. When a ship lands Gus doesn't know if his visitor will be a famous movie star, an international banker, a slack-suited glamour girl, a foreign diplomat or a student from a coast flying school. They are all welcome to Gus and they all get the same service, That is, until some of the pseudo-great prove they don't deserve it.

Speaking of landing, Gus reminded me that desert flying differs from that of other climates.

"One can never be an accurate judge of air conditions," Parrish explained. "Sometimes the air is like we were at sea level and then again it is as if we were at 7,000 or 8,000 feet. The winds that whip down from the mountains on occasions are tricky and I teach my students to do cross-wind landings. To take advantage of the wind at my field, we'd have to build circular runways.

"Too, air currents seem to make even the best of pilots misjudge conditions both in cross-country flying and in landing. At the field we have seen numerous pilots from the coast as well as other distant fields go around the port trying to make up their minds how to land and then make a mistake. Frequently they overshoot the field and, because of the hot days found at the beginning and end of the season, pilots are thrown off their judgment and often times come in far too fast or too slow. On days when the temperature is high and the air still we have seen pilots 'land' on heat waves ten feet in the air.

"During the summer the heat goes far past 100 degrees many times and as a result of this the airport operates on an October 1 to May 1 schedule. During the summer I get my vacation and relaxation by driving a motor stage in Rainier National Park.

"Of course, desert flying has its added hazards and a forced landing in many spots of the Colorado or the Mojave is something to be avoided. Many of our trips involve flying over mountain ranges where, if one wanted to land, he would have to pilot a mountain goat with wings instead of a ship. Too, the strange wind conditions are such that there are days when it is best to fly next to the hills and the following day it is dangerous to get anywhere near these same hills—and I mean hills that average from 7,000 to 10,000 feet high."

Parrish, however, wants to give credit to Bill Seaton, the flyer who first saw the possibilities of an airport at Palm Springs and thereby gave Gus his chance to make good. I dropped by to see the genial Seaton, who has retired from the flying game and is a contractor in Palm Springs.

The winter of 1927-28 found Bill, who was one of the 25 American aviation

(*Continued on page 78*)

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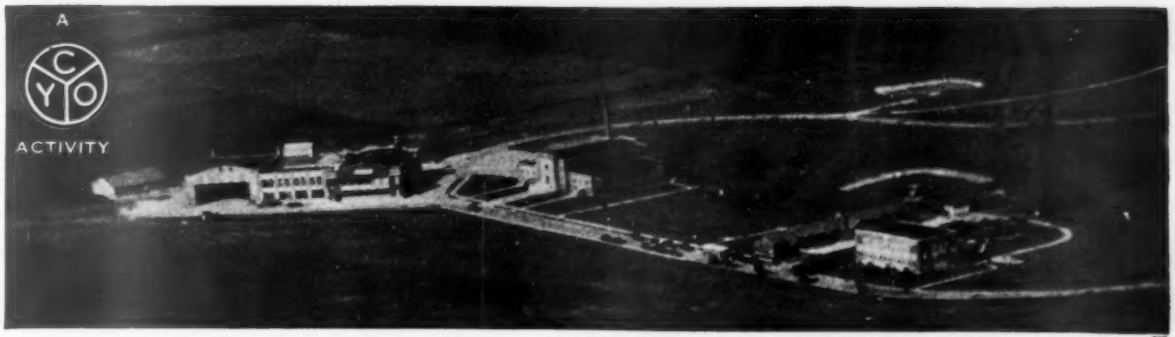

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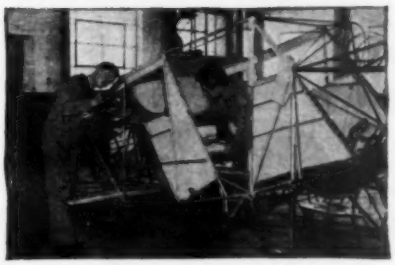

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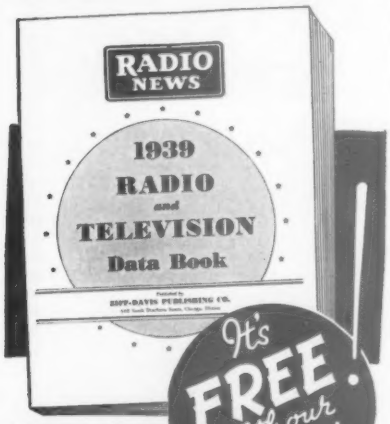

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Take Care of Your Lightplane

(*Continued from page 49*)

variations of the change that would be of increased value to the owner.

There are quite a few accessories now available to the lightplane owner all of which help operations, though in a few cases they add to rather than decrease maintenance time. The use of a tailwheel is recommended if the ship does not have one for standard equipment, for it will not be necessary to keep replacing tailskid shoes and will decrease landing stress on the tail. For some ships, combination cabin and carbureter heaters are available, both of which are somewhat of a necessity for winter flying. If the ship has a cabin heater of the manifold type it is essential to examine it frequently to insure against the exhaust entering the cabin duct if the manifold rusts through. Even in an open lightplane monoxide fumes are dangerous, if the pilot or passengers breathe in the fume zone. Care needs to be taken that exhaust outlets are kept away from fabric and from underneath the carbureter, or any other place where gas is liable to drip and either the gas or the fumes be ignited.

On the average lightplane there are a number of items which tend to give trouble unless they are watched and means taken to overcome the faults. Gas tanks, valves, lines, strainers and primers need be carefully checked. On one very popular lightplane the gas tank is over the feet of the passenger in the front seat and there is a tendency for some passengers to accidentally push against the line with their feet. On quite a few ships of this model the line flange which is soldered to the tank bottom has loosened, causing gasoline to drip or flow on the passengers' feet. This same ship has a primer of a type which tends to leak, unless the shutoff is kept in good condition. This habit of leaking tends to cause faulty idling, for the gas from the primer tends to richen the mixture. Glass strainer bowls, as used on most lightplanes, are good inasmuch as they permit visible inspection of strainer dirt or water, but great care needs to be taken to prevent cracking. Some owners seldom if ever check the bowl and, as often as not, it will be found that the bowl is full of water, especially if the ship is gassed from cans or drums kept in the open. As most of the lightplanes use tanks of soldered ternplate construction it is not amiss to frequently check the tank, when empty, for signs of rust on the inside.

The use of sheet pyralin for windshield use, has not been entirely satisfactory on lightplanes for the thin sheets, as generally used on the production ships, have a very short life. Weather resistance is lacking and bright sunlight will soon damage the pyralin. This problem can easily be taken care of if the shield is replaced with one of heavier section and reenforcing strips are riveted around the edges to prevent cracking. Cementing with dope a strip of the same material, about three quarters of an inch in width, around the edges of the windshield also will prevent cracking. If the ship is stored outside a cover of lightweight white duck should be made to hang over the windshield. This alone will greatly lengthen the life of the pyralin by protecting it from the sun and weather. Various pyralin restorative solutions are available. Some are quite successful, but it is better to keep the pyralin in good shape rather than to try restoring it after it has weathered.

Maintaining structure is a somewhat easy job on the average lightplane—if the ship is not given much rough treatment. However, there are a number of points to keep watching for the general welfare of both ship and owner. Wing drag wire bracing needs be watched on some ships, for a few models were equipped with rather light wires which snapped easily. Cutting small holes near each compression member and installing zipper fasteners will permit ready inspection. On lightplanes using stamped metal ribs, it is vital that all ribs be watched where attached to the spars for, though these ribs have ample strength, liability of failure exists due mainly to ground handling and vibration. Leading edges are easily damaged and, if the ship is used frequently for training or stunting, there exists the possibility of the nose ribs or formers loosening which in turn will loosen the dural covering, all of which will cause the leading edge to be damaged or perhaps collapse in a fast dive. Some ships are inherently weak in this regard and means should be taken to strengthen necessary members.

The control system of the average lightplane generally has a few points which need attention frequently and, in most cases, these can be so rectified that they present few problems. One of the best means for easy and free control is to replace all plain bronze bearing pulleys with commercial unground ball bearing pulleys. These are cheaper than the ground bearing type and, for lightplane use, are good enough for most installations. Such pulleys need no lubrication

(*Continued on page 86*)

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I Learned About Flying . . .

(*Continued from page* 19)

elevation of Fairbanks and my altimeter just about coincided. But we couldn't see anything.

"Get out of this," Frank said. "If you don't, we'll hit something sure."

"Pull up," Charlie urged. "Maybe this mess'll lift."

"Okay," I agreed. "We've got just about two hours of gas."

So up I went. The minutes dragged by into one hour, and then into two hours. During this time, we did a lot of work.

"It looks like a crash," I told my companions. "We might as well make it as safe as possible."

That was just like saying that we had an hour or so to live. But the boys went to work. They disconnected the batteries. They disconnected the radio. They tied everything down. Then Charlie got the portable typewriter and started writing his will. As I said in the beginning, he wrote it nine times. In fact, he was still writing it when we hit. Just as we were getting down to our last gasoline, I told the boys:

"I'm going into a power dive at a safe altitude. I'll open all the motors wide, and then I'll cut the master switch. That'll let anyone know—provided I'm right and we're still in the vicinity of Fairbanks—that we're making a crash landing."

I did just that. As the motors coughed for the last time, Frank cut off the main lines and leads, kicked the safety valves open, and down we came. I leveled off considerably, until we were gliding between 58 and 65 m.p.h.

The first thing I saw was three spruce trees, almost directly ahead of me. The next thing a sort of brown grass. I missed the trees, hit what I thought was the grass. It wasn't grass. It was marsh, or tundra—a mucky, messy, watery formation like a bog. The ship skidded across it for about 75 feet, started settling and then rolled over on its back. We were down, all right, and how! Muck and slime were pouring into the ship. It was settling into the slop. We couldn't get out at the rear because of the empty gasoline tanks. So I smashed the cockpit windows. Ooze and slime poured in. But I poured out. I grabbed at Tomick.

"I'm stuck!" he yelled. "Something's grabbed me!"

He had his left foot stuck in the wheel of one of the cockpits. Charlie came out last. There we were, ship upside down and sinking fast in the muck. We were pondering what to do when we heard yells. Pretty soon some men came up.

"Where are we?" was my first question.

"About half a mile from the edge of Fairbanks," one fellow said. "We've been listening to you for the last couple of hours."

I don't know and never will know how I did it.

But now we come to the point of the story. Today, nearly two years later, I'll make a frank admission. I never should have done what I did. Even with orders to get through any way possible. Good navigation? Yes. Good piloting, as far as handling the controls was concerned? Yes.

But there, on the tundra, lay the wreck of a good airplane. By the grace of God—and I say that with all due respect—three men who had been in the ship were alive. The plane itself could never be of the service for which it was intended. In fact, with motors gone, I hear it is still bogged down in the ooze of that tundra. And we learned later that the Russians had undoubtedly struck an iceberg and had perished. Three deaths might have been added to six.

The lesson I learned?

That, whether or not lives are at stake, taking chances is silly. A lot of us take chances in airplanes every day with no lives at stake. We get all excited about something that has to be done and we fly madly to do it. Sometimes the results are disastrous.

Today, after that experience, no matter how urgently I may think I have to go some place, I stay on the ground unless the weather is right at my destination.

END

Howie Wing

(*Continued from page* 46)

pushing back into second place the cop on the beat, the first baseman on the local baseball club or the engineer of the 5:15.

Bill Moore is educating the youth of America in aviation, but the youngsters are not aware of it. He points out that if the youngsters felt that the Howie Wing program was designed to educate them, they might tune their radios to something else. Instead, the Howie Wing story has enough dramatic situations on the ground to hold any youth's attention, but is so technically accurate and informative that its educational value cannot be estimated. The program is sponsored by the Kellogg company, cereal manufacturers.

The question most often asked of Bill Moore is, "How is Howie Wing produced?"

The adventures of Howie Wing take 13 weeks each. In other words, Howie is off on another dramatic story every 13 weeks. A few months ago he was working on test flights aboard an imaginary *Clipper* plane, the finale being the crossing of the Atlantic ocean. As this is written, Howie and his air-mates are investigating a flying school racket at Lone Rock, Oklahoma. In another few weeks Howie may be a co-pilot on an airline or he may be flying mail across the frozen wastes of Alaska. Bill Moore's imagination is coupled with cold facts to produce his story. In anticipating the sequence about *Clipper* planes, Bill went to Miami and spent several days reviewing the operating practices of Pan American Airways. His research is always going on, digging out facts and figures

(*Continued on page* 76)

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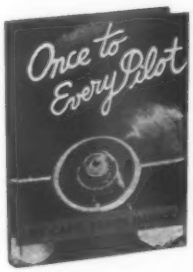

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POPULAR AVIATION

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Howie Wing

(Continued from page 74)

so that every little detail will be factual.

Every morning Bill Moore leaves his large, rambling home at Winnetka, Illinois, and motors to Chicago, arriving at his "office" at nine o'clock. Publicity stories paint pictures of Bill Moore's writings in a lurid, typically Greenwich Village style. But, he has no secret hide-away. His "office" is a comfortable apartment on Chicago's near north side—furnished with desk, typewriter, wall maps, file cases, bookcases and reference books. He functions the same as any other business man at work. Not the least bit temperamental, his telephone is never shut off, he answers all calls personally, answers all mail personally. From nine o'clock until three he dictates (or writes) the adventures of Howie Wing. Each plot is carefully thought out in advance. He usually writes each episode a month in advance.

From three until five o'clock he devotes to his personal affairs, perhaps conferring with the sponsors or the advertising agency. But, promptly at five o'clock he is driving northward to Winnetka, the radio in his car tuned to Columbia's Chicago station. He listens to Howie Wing from 5:15 to 5:30, carefully checking the performance of each character and gauging the potency of that particular episode. Should Bill Moore discover that a certain member of the cast is not up to standard, he makes note to discuss the fact on the next of his frequent flying trips to New York—where the program originates.

Copies of the script are mimeographed and sent to New York. The cast spends several hours each day in rehearsal—each show is presented twice daily: at 6:15 New York time for the east and middle west, and again at 8:15 New York time, for late afternoon consumption in the Mountain states and on the Pacific Coast. The program's audience, research shows, is 70 per cent children and 30 per cent adults, so Bill omits situations dealing with adult problems that might confuse children.

Sound effects play an important part in the success of each Howie Wing production. These are all carefully figured out in advance by Moore and the sound effects experts of Columbia. A typical day in the Howie Wing program might call for sound effects such as these: water running from a faucet, closing the door of a transport plane, starting a 1,100 h.p. engine, propeller noise from a diving pursuit plane, wind whistling through flying wires in a glide, creak of a rickety wooden door, movement of a floor board, jingling of a telephone bell, distant buzz of lightplane as it passes high above the ground.

One of Bill Moore's greatest kicks is in reviewing the fan mail which is written in all sincerity by youngsters in all parts of the country—every letter is addressed to Howie Wing and every letter is given a thorough answer by Howie Wing. Bill recalls the letter he received not so long ago from a blind boy who said he really got the "feel" of flying by listening to Howie Wing. Most of the fan-mail letters inquire about entrance requirements to Army and Navy aviation training schools, location of commercial flying schools. Other letters inquire about model airplane building, and it is not rare for a youngster to inquire about recovering from a tailspin or how to execute a barrel roll. The girl listeners, of course, want to know chiefly about how they can prepare for a career as air stewardesses. The girl interest in the Howie Wing plot is supplied by Donna Cavendish, who accompanies Howie and the fatherly Captain Bill Harvey on most of their trips.

When Bill Moore is not engrossed in producing his program, he is relaxing at home, enjoying the companionship of his charming wife and their four children: Billy, aged 13; Eric, 5; Nancy, 11; and Patsy, aged 9. Blonde Eric, though the youngest of the family, is perhaps the most air-minded.

Captain Moore's study at Winnetka is a real aviation trophy room, his large desk overlooking the lovely grounds surrounding the house. Scale models and pictures have been artistically placed around the room. On the east side of the house is a large beach, onto which lap the crystal clear waters of Lake Michigan. On this beach Bill Moore is a familiar figure all summer, and in the winter time he enjoys skeet shooting. Bill Moore is a virile outdoor man—he enjoys skiing, once having skiied 150 miles in five days—because there was no other way to journey from Beaver to Richfield, Utah.

Despite his busy schedule he finds time to keep his hand in flying with the Air Corps Reserve unit at the Chicago municipal airport. Sunday mornings he is often away from Winnetka long before the crack of dawn to hunt for pheasants or ducks. Eric and Billy are his constant companions on fishing trips. He is a vigorous tennis player. He is an enthusiast about anything mechanical and would rather make repairs on his own cars than rely upon the local garage mechanic. A lover of animals, he has always had at least one dog and a cat: his ambition is to own an Eskimo husky or a Great Dane. Perhaps his Michigan boyhood gave him a flair for the north country. This coming summer he plans an expedition to the Arctic Circle, probably to gather material for more of Howie Wing's adventures next fall.

Stewardess No. 500

THE 500th airline stewardess to be hired by United Air Lines is Miss Ann Eslinger of Cleveland. Miss Eslinger is 23, an attractive brunette, of American-French parentage. United now has about 130 young ladies in uniform in its planes. Of the other 370 who worked for the company from time to time, most have resigned to be married.

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The Man Under the Hood

(*Continued from page 55*)

would give Jules Verne something to gulp over, we understand . . . we reported some time ago that the ship's wing span will be close to 250 feet . . . Someone heard the other day that *one wheel* will weigh nearly a ton! . . . it'll make the DC-4 look like a go-cart . . .

* * *

Howard Hughes' round-the-world Lockheed is rumored to be hangared at Bendix, N. J., where it's having an inner-pressure cabin installed for a sub-stratosphere flight, supposedly to **South America** . . . date: about September 1 . . .

* * *

Don't be surprised if you hear four airline pilots putting on a little ocarina quartet on Major Bowes amateur hour . . . they're from **Northwest Airlines** and, we hear, they've been pretty hot at recent rehearsals . . .

* * *

We're liable to get scooped on this because of the time involved between the time this is written and the day this issue appears on the newsstands . . . but we're pretty sure Chicago and Southern Airlines (Chicago-Memphis-New Orleans) will be the first American airline to get the new **Douglas DC-5** . . . Northwest Airlines also is said to be quite interested in this ship . . . so is Pennsylvania-Central . . .

* * *

Lockheed again . . . this time we have word that that progressive company has made another sizeable export "killing" . . . the ship is a military version of their small "12" twin-engined transport . . . the customer is the Netherlands East Indies . . . that government (it's the one that bought quite a number of those twin-engined Martin bombers a few years ago) ordered 12 Lockheeds at a cost of $690,000 . . .

* * *

That young **Army** pilot who was killed by the crack-up of his Seversky P-35 recently near Detroit got onto the front pages of the country because of the rumored presence on that ship of highly secret gun sights . . . according to our report, **Army** men rushed to the wreckage only to find that the secret sights had mysteriously disappeared from the ship's remains . . . we don't know anything further on this because the whole affair suddenly was clamped down on and silence has reigned since . . .

* * *

One of our reserve corps pilot friends says that new **Army** gun-sight is wonderful . . . its details are secret but a light from an electric bulb plays an important part in it . . . those who've studied the matter say it's far more accurate than the old wartime sight.

* * *

There's not a 400 m.p.h. airplane with any service squardron today, but the **Army Air Corps** has three machines that are definitely in that class, and soon will go into large-scale production on them. . . . furthermore, Gen. H. H. Arnold told the House Military Affairs Committee in Washington recently that the **Army** is looking now toward a 500 m.p.h. airplane and toward power-units of 3,000 h.p. . . . he said the 2,000 h.p. engine is here today . . . remember, months ago we told you about the 2,000 h.p. (for take-off) **Allison?** . . . now **Pratt & Whitney** and **Wright** have radials in this class. . .

* * *

Did you know that, out of every dollar taken in by one of the nation's leading airlines, 30c comes from mail, 68c from passengers and 2c from air express? . . . which may explain why the lines are concentrating on passengers and, lately, express . . . hoping to close out "subsidies" . . .

* * *

About the **Bell** *Airacuda* . . . we hear that at high speeds—somewhere above 300 m.p.h.—a dreadful flutter develops in those pusher propellers . . . we've heard that this is caused by the turbulent air in which they turn . . . that story first reached our ears some 10 weeks ago . . . we tried to verify it but couldn't . . . the new batch of 13 **Bells** now under construction are supposed to be somewhat modified to eliminate—if possible—this difficulty . . . also you may see something of a tricycle landing gear on the new *Airacudas*. . . .

END

Desert Pilot

(*Continued from page 70*)

cadets trained by the French Air Corps for World War duty, barnstorming and operating an airport at Riverside, California. Bill on a flight down the valley one day was forced down on a golf course under construction on the P. T. Stevens estate at Palm Springs. Stevens found himself engrossed in Bill's yarns of the air and by morning he and Bill had concocted plans for an air field at Palm Springs.

After successfully operating the field on the Stevens estate, Bill moved his hangars down to the Indian reservation when the Chamber of Commerce got a lease on the land from the Department of Interior. Airtech, of San Diego, subleased the field for a winter training school and for two years, under Seaton's direction, the project prospered. Then the depression took its toll. Seaton stepped out and other operators unsuccessfully took over the field and the airport reached its state of inefficiency in which Gus Parrish found it.

Incidentally one of the mechanics who was under Seaton was a quiet, moody lad named Douglas Corrigan who was working his way through Airtech and had been sent up from San Diego. Seaton was impressed by the youth who was always the one selected when, as Bill says, "instructors wanted anything done right." Regardless, Corrigan wasn't able to get much flying in as Seaton did most of the piloting himself. After a few months at Palm Springs, Corrigan asked to be sent back to San Diego and this request was granted.

But Gus Parrish likes it.

END

Iron Mike

(*Continued from page 30*)

knob rotated so as to wheel the plane at the desired rate. If a course correction of small degree is needed, a slight turn of a knob to right or left takes care of it.

If a pilot wants to start his glide a hundred miles from his goal, he turns a knob slightly and forgets Mike for the next 30 minutes. Mike starts the glide.

In the multitudinous records which tell of Mike's steadiness under stress is the story of the transport ship which flew straight into the teeth of a storm. Suddenly lightning blinded both pilots. They groped for 15 or 20 seconds. When they regained their sight, everything was in order. Mike was carrying on.

Mike rose to the occasion in another transport when a bird hurtled through the windshield and turned the cockpit into a bedlam. When the pilots got the feathers out of their ears, there was Mike, and there was the ship—on an even keel and on course.

Mike lent a hand in a private ship when the controls iced up. Things looked bad. At that level the icing would continue. The pilot had to change altitude. He pulled at the wheel. The elevators were frozen solid. Then he turned on Mike and rotated a knob. Together, Mike and the pilot wrestled the ship into a warmer stratum of air.

You can take it from Duncan McCallum: "A great fellow, that Mike!"

END

Lose Something?

ABSENT-MINDEDNESS when it comes to personal effects, has long been a trait of travelers, and air passengers are no exception. This was revealed recently when a survey was made of the many hundreds of items gathering dust in the lost and found department of American Airlines in Chicago waiting for someone to claim them. A list of articles inventoried in the survey covered 30 typewritten pages.

Honors seem to be evenly divided among the two sexes as to which is the most absent-minded, although the males seem to have the edge for this questionable honor. Perhaps the king of the lot was the passenger, who somewhere along the line, gathered his belongings together, got off at his destination, and left behind a new gold plated saxophone replete in its case. No claim has ever been put in for this article.

If one wanted to select an outfit to wear to any occasion there are the following to choose from: 11 gray hats, three cowboy hats, 17 panama hats, a dozen raincoats and top coats, a lady's black straw hat with veil, umbrellas, canes, gloves, silk stockings, galoshes and rubbers, bedroom slippers, and two score pairs of vari-colored pajamas.

There are scarfs, cameras, pens, binoculars, eyeglasses, and assorted jewelry. There is a tin bank (unopened) containing an undetermined sum of money and $17 in bills. This could go on forever, but there are silver teething rings, teddy bears, toy dogs, dolls, and rubber sheets; not to mention a pillow and pillow case, a filter for a camera, the manuscript for a radio program, and 300 assorted books of fiction and fact.

According to American Airlines' officials every effort is made to trace the owner of the property, and all such goods is kept in storage.

Gas Model

(*Continued from page 62*)

Finishing Details.

All other little items, such as battery rack, installation of material, control tabs, etc., are clearly explained on the plan. Study them carefully. In test flying your model, we suggest that the batteries be in position and the gas tank full of fuel.

Launch the model in a slightly downward position over some tall grass so as to prevent any injury to the ship. If the nose of the model rises abruptly, move the batteries toward the front of ship. Or, if the model dives suddenly, move the batteries toward rear.

Make sure the model glides on an even keel. You now are ready to test your ship under power. Use a very small amount of gas on the test flight or your model may fly away from you. A flight timer is also a very satisfactory means of cutting your motor off after a few seconds run.

END

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A.T.C.

(*Continued from page 34*)

come in and it made its way through the soup to the ground, the ship directly above was instructed to drop a thousand feet to the level recently vacated by the ship which had just made a landing. And so on, all the way up the line; each ship dropping a thousand feet. This process is known as "laddering down."

At times, congestion became too heavy and there seemed a possibility of too much gas consumption by the ships above. Those on the topmost rung were advised to continue on to Floyd Bennett airport in New York, or even to Camden, N. J.

Because the situation was controlled by level-headed, experienced men on the ground, things were at all times in hand. Naturally, all planes were safely landed in due course of time.

Let's take a theoretical flight from Cleveland to Newark. Before departing the pilot of our ship has submitted his flight plan to the company ground station at Cleveland which, in turn, puts it before the Cleveland Airways Traffic Control office for approval.

Cleveland okays it to 25 miles east of Mercer, Ohio, at the same time TXing the complete plan to Mercer, Bellefonte, Allentown and Newark, whose jurisdiction we will be under when we reach Mercer. Newark thereupon estimates the plane's arrival time over Mercer, sends a PX to that point, telling them to work the flight—if it is a private, itinerant or military plane—giving approved altitudes. If it is a scheduled airliner, the instructions are issued from the company dispatcher at the Newark ground station. For clarity, we will assume this ship is receiving instructions all along the line.

An approved altitude of, let us say, 9,000 feet to Bellefonte is given, with instructions to contact that station on crossing. There he is told to continue at the given altitude over Allentown. At Allentown he is told, because of traffic, to descend to 7,000 feet. Flights take odd altitudes going east. Then he is told to continue at that altitude until he is over New Brunswick where he is instructed to drop to 3,000 feet. At New Brunswick he is informed he will be the third ship into Newark, there being two other ships ahead of him, one from the west and another from Boston.

Ship No. 1 is told to cross the Mitchel intersection, near New Rochelle, N. Y., at 2,000 feet. This ship is estimated in at 11 o'clock. He reports his position over the Newark radio range station at Elizabeth and is told to hold at 1,000 until advised the field is clear to land.

In the meantime, Ship No. is told to cross New Brunswick at 2,000 feet and hold that altitude until No. 1 is cleared in and landed. At approximately 11:13 No. 1 is on the ground and No. 2 from the south is told to report at 1,000 feet and land.

Our plane has followed suit, dropping from 3,000 to 2,000 having received the report that No. 2 has reached 1,000. Over the Newark station our ship circles, apparently in an aimless manner, until the radio informs the pilot No. 2 is safely on the ground.

When the second ship has landed, Airway Traffic Control clears our ship and we set down safely through the stuff to a clear field. Thus there is no chance of three ships tangling wing-tips in the overcast, a condition that might easily prevail if there was no Airway Traffic Control on the ground to play the traffic cop.

Certainly, it annoyed the crotchety old man on the Cleveland-Newark plane. How was he to know all this? Who had the time, inclination or patience to explain it to him? And the chances are he would not have listened if they had.

The next time you come in by airplane and the ship starts circling and circling for what seems to you to be an indeterminably long time, just relax. Take out a cigarette, read a magazine and wait. There's nothing else you can do about it anyway.

If you should happen to be a co-passenger of the crotchety old gent or his counterpart, incidentally, take time out and tell him what its all about.

END

Static!

(*Continued from page 17*)

Aeronautics Authority); Capt. Bert Ball of United's regular flying staff whose interest in overcoming static led him to seek and receive a leave of absence to fly the research plane on its static-hunt; Professor R. H. George, outstanding scientist of Purdue; Doctors A. A. Knowlton and Marcus O'Day of Reed College's laboratories; Professor E. C. Starr, noted Oregon State College scientist; and engineers from the airline as well as accessory manufacturers.

For weeks, even months, this planeload of "detectives" sought out static, flew in static-producing conditions and made intensive observations and developed experimental static suppressors which were one after another tested and discarded. On all of these flights one engineer—H. W. DeWeese of United—sat in the cramped nose compartment of the Boeing hunched over a recording meter, with earphones and microphones for communication with engineers in the cabin of the ship. With the nose door closed, there was no window or port through which he could see. DeWeese flew thousands of miles without once seeing anything but the tarmacs of the airports where the plane was loaded and unloaded before and after take-offs.

Then was made the significant discovery which paved the way for the ultimate solution of the problem. Instead of the static interference being caused by the impinging of electrically charged moisture particles on the airplanes' metal surfaces, it was found to be caused rather by the leaking off from the airplane of the static electricity accumulated by the airplane's passage through clouds or other conditions of electrically charged particles

from which the electricity was attracted to the airplane. With this knowledge the engineers moved swiftly to control the discharging of static electricity from planes in flight. It was found, for instance, that the leakage was in the particular part of the airplane where the points were sharpest—tips of propeller blades, the corners of the trailing edges of ailerons and other points.

The hunt for static was over. The flying laboratory was released to other projects, most important of which was instrument landing research. Meanwhile the scientists went back to the laboratories and in United's at Chicago midnight oil was burned while the engineers went about the problem of devising some method of discharging the static harmlessly from the airplane.

Exactly one week after that Christmas day flight of the *Continental*, when Captain Berger pressed a button and made static vanish as if he had magically rubbed some Aladdin's lamp, United announced that its entire fleet of Douglases were equipped with small cartridges—two to a plane—which, combined with the loop antennae as standard equipment on all its planes, gave the effective static suppression which culminated five years of intensive war waged against this aviation obstacle.

The cartridge which is used to solve static is a simple and efficient installation. Two cartridges are housed in twin tockets in the tail of the ship. The cartridge itself consists of a reel around which is wound a ten foot length of specially impregnated cord and fine wire, to the end of which is attached a paper drinking cup.

When the pilot encounters a static condition that interferes with radio reception he flips one of two toggle switches in his cockpit to the correct position, and a green light turns on to signal that the cartridge is in proper position and ready for release.

He then flips the same switch to the release position which electrically cuts out a magnesium strip which holds the cartridge in the spring socket. The wire and cord are ejected from the tail and stream out to the full length. The wire is of finest steel and has a diameter appreciably smaller than the size of the sharpest point on the airplane itself. The accumulated static is discharged across the wire and into an area well to the rear of the airplane.

The device now is manufactured by Bendix corporation with which an agreement for the production was negotiated by J. R. Cunningham, Director of Communications of United Air Lines, and is available for installation on any planes in the U. S. To refill these cartridges costs only a few cents apiece and they are tucked into the sockets at the end of a flight during which either one or both of the cartridges has been used.

Today the cartridges are used frequently, as this evidence in the form of actual reports from United's pilots, indicates:

Captain Bunge: "Used static discharge cartridge in moderate snow static; worked perfectly."

Captain Quivey: "Released anti-static cartridge; completely eliminated moderate static."

Captain Smith: "Moderate static. Pulled anti-static cartridge; worked very well."

Captain Ball: "Frying noise started to take our short wave south of Baker in small snowflakes. Released near trailing wire and cleared short wave entirely. The wire with cone showed no wear after landing 45 minutes later."

Captain Angstadt: "Discharged No. 2 anti-static cartridge during light snow static condition. Results very good on both long wave and short wave."

Perhaps this device is not the final answer. Aviation experts, though, agree it is an admirable step forward.

END

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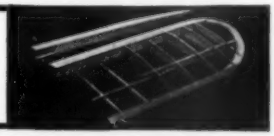

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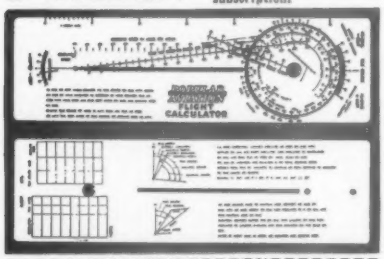

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Research Is Power

(*Continued from page 23*)

laboratories begin to improve aircraft design.

For several years there has been rigid censorship of information concerning activities of the N.A.C.A. at Langley Field. No descriptions may be published of the technical details of the more advanced research equipment there, and photographs are taboo. It was impossible, for example, to obtain an aerial photograph of the N.A.C.A. laboratory group, comprising 19 buildings on a tract of 24 acres, to illustrate this article.

The N.A.C.A. was created by Congress in 1915, after the first year of conflict in Europe had demonstrated the potential value of the airplane as a weapon of war. For about 10 years the Committee functioned as a research agency for the military service and then extended the scope of its activities to include civil aviation when air traffic began to assume commercial importance.

"Today," the National Resources Committee said in a recent report to Congress, "it (the N.A.C.A.) performs a unique function which the nation could not well do without but which is beyond the resources of any but a governmental institution. The performance and potentialities of aircraft are revolutionizing the concept of national defense the world over. Aeronautics is becoming a factor vital to national existence. Its importance in international commerce is now just beginning to be felt.

"As a rapidly advancing branch of engineering science, aeronautics has received from the Government of the United States and from the leading world powers special consideration and generous support. There is today an intense international rivalry in the design and production of aircraft of the highest possible performance, efficiency and safety. For the past decade the United States has led the world in this effort. This has been due chiefly to the sound organization for scientific research in aeronautics, and to the generous support and complete freedom of action accorded by the Government to its aeronautical research organization. The present American leadership is seriously threatened by the greatly increased interest in and support of scientific research in aeronautics by leading world powers during the past two years."

Fundamental aeronautical research is conducted under the auspices of the N.A.C.A. through standing subcommittees on aerodynamics, power plants for aircraft, aircraft materials and aircraft structures. Specific research programs are recommended by these subcommittees, which represent all governmental agencies concerned with aeronautical development and the manufacturers of aircraft and equipment.

In support of the special $12,723,000 program for the N.A.C.A., the budget bureau reported that the supplemental estimate "will enable the Committee to keep abreast of the numerous recent requests of the military establishments" by increasing its technical staff "and by expanding the Committee's program of encouraging research in scientific and educational institutions and contracting with such institutions for reports on special problems."

The estimate for Langley Field, the budget bureau reported, "will permit the Committee more promptly to complete work now on hand and to prepare in part for the large increase in requests that is anticipated in connection with the contemplated expansion in military and civil aeronautical activities."

The proposed new Sunnyvale station is to be located on land now owned by the Army but formerly developed by the Navy as a West Coast airship base. Approximately 50 acres will be allotted to the N.A.C.A. Some of the facilities, although similar in character to those at Langley Field, will represent "material improvements" over those at the older station.

"In every case," the budget bureau explained, "the facilities will be so designed as to provide for the investigation of the new range of problems arising from the development of aircraft of higher speed and larger size, and will enable the committee to meet the demands for scientific data relating to the design of military aircraft and to keep pace with the demands of the industry for research information."

In reporting the Independent Offices appropriation bill to the House, the Appropriations Committee said: "Recent events have demonstrated the dominance of air power in international affairs. The effectiveness of an air arm, however large, is dependent upon constant progress in the engineering science of aeronautics. Recently the aeronautical research activities of foreign powers have been greatly accelerated with resulting improvement in their military aircraft. In order to make possible the development by our Army and Navy of aircraft at least equal in performance with those of any other nation, the United States must place greater emphasis on aeronautical research."

Danish Fighters

BRITISH two-seat fighters developed from an extremely fast light bomber monoplane have been chosen to equip the Danish Navy. They will be built in Denmark under license from the designers—the Fairey Aviation Company; decision to purchase British airplanes was reached after a Danish expert commission had examined aircraft submitted by leading continental manufacturers, including German and Italian constructors.

Originally designed as a light bomber, and then styled the P4/34, the "prototype" had a maximum level speed of 283 m.p.h. It is powered with a Rolls-Royce *Merlin* engine. In its new form the airplane will be armed with eight machine guns. It will have special flaps to act as air brakes and thereby control diving speeds.

Airy Chat

(*Continued from page 8*)

are, while the retractable landing gear was used on at least one old-time airplane that comes to mind—shortly after the World War.

* * *

"IRON MIKE" is the result of a stormy flight recently on an airline. We sat and watched the bobbing and bucking wings of the big ship and noticed the extreme sensitiveness and instant response of the ailerons as each bump was ironed out almost before it happened. If you've flown the airlines much, you know that this fine-cut precision piloting is the work of the gyro-pilot. Airline pilots long have listed Iron Mike among their closest friends. We thought Mike well worth an introduction. Don't you?

* * *

TEX RANKIN, as we recall it, gave us the idea over a Hollywood dinner table for "I Learned About Flying From That." We were discussing possible subjects he might write on. That was one title he suggested. We thought about it on the Seattle-bound plane and several times again on the flight home to Chicago. The idea seemed too good to end with just one article. By the time we were in sight of Chicago's airport we had the preliminaries for the series which starts on page 18 of this issue. Oddly enough, Tex's article on the subject has not yet arrived. Paul Mantz is slated for the next issue.

* * *

WE stood with Dick Kirschbaum at Newark airport one day not long ago. That is Dick's beat for his newspaper (he's the only American newspaperman who writes a daily aviation column). We watched airliner after airliner wheel around the field boundaries, each of them going through motions with the deftness of a checker game. We marveled at the dispatch and orderliness with which those aerial giants arrived and departed. Dick probably sensed what it was that interested us and began to describe the jewel-movement workings of Airway Traffic Control. Dick himself was "in" on the birth of A. T. C., so he was justly enthusiastic. We finally got him calmed down. But only after promising him a chance to cut loose on his typewriter. See page 32.

* * *

THAT was a slightly bum steer we gave you last month on the results of our recently completed reader survey. No. 1 favorite was not the front covers; first place goes to "articles describing aircraft." Additional interesting discoveries: average number of solo hours among reader-pilots is 233.4; our readers own more *Cubs* than any other make, Wacos are second, Aeroncas third, Taylorcrafts fourth, Curtiss models fifth, Stinsons sixth and so on. An independent Department of Aviation in the federal government is favored by 82.5 per cent of POPULAR AVIATION's readers. Readers have been reading P.A. on an average of 3.6 years each. We'll have more on this for you next month.

* * *

A GOOD many of our readers will be especially interested in the big directory issue of our sister publication, POPULAR PHOTOGRAPHY. It is POP PHOTO's second anniversary and the special issue—which goes on the newsstands simultaneously with this issue of POPULAR AVIATION—contains 182 pages, 20 separate directories of cameras and miscellaneous equipment, a special full-color insert as well as a brilliant front cover by famed Ivan Dmitri (he made POPULAR AVIATION's March front cover photograph). Tip to our camera fans: *Don't miss this issue.*

* * *

INTEREST in aviation is zooming to unprecedented heights. We have a good sign of that from our own circulation figures. Our January, 1939, issue sold over 70,000 copies with the February issue headed for the 75,000 mark. But a year ago, the January issue only sold 57,000 while January, 1937, was good for only 54,000. These figures, of course, are not exact and are merely indications of a steady climb in the interest in aviation. The more we look at them, the more we wonder what the future holds in store. Particularly with the boom in air activities. . . .

* * *

Think we'll hit a million? M. K.

END

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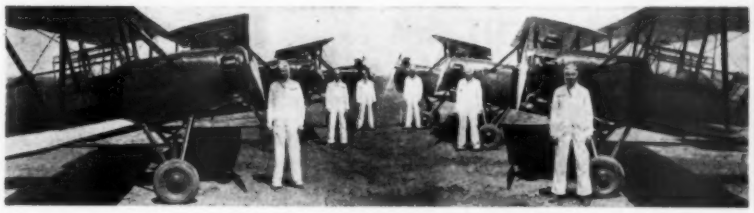

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Doctor of Safety

(*Continued from page 48*)

system." Stark got the idea for it while wrestling with the maze of details that beset the airline pilot who is maneuvering around a busy airport for a landing on a foggy night—the task of flying his ship on instruments, talking with the airport dispatcher on his radio, lowering his landing wheels, wrestling with the stabilizer, changing his headings.

"Now where's that blamed airport," many an airline pilot has demanded under such circumstances, the mass of detail erasing from his mind the exact picture beneath him.

Stark's orientator is designed to keep that picture, properly aligned, before him even when he can't see beyond the edge of his cockpit. For the orientator is a form of the directional gyro constructed so as to keep before the pilot a properly orientated, circular chart of the airport at which an approach is being made.

Installed, it looks something like a compass, and it's just as simple to operate. Nope, you'll not need it rounding your home field on a sun-washed day to shoot a few spot landings. But try it out on a dark night, groping through fog around a strange airport, with a load of passengers dreamily reposing implicit confidence in your ability to bring the plane down on the airport and not in a neighboring cornfield.

"In spite of the worth of this instrument," said Stark, "few people see its real value without having a chance to fly it. The usual inclination is to regard it as a means for holding and turning a range manual map, when in reality, the map remains aligned with the corresponding points on the ground and the plane turns or rather, in effect, flies over the map."

In operating the instrument, the gyro is set to the reading of the magnetic compass, aligning the orientator map, which is offset for variation, to the corresponding points on the ground. By tuning the radio to the station approached—which point on the orientator is the center of the map—the pilot is able to visualize at all times the proper line of flight, regardless of the position at various intervals or his maneuvers.

"It is obvious," said Stark, "that the more elaborate the radio equipment, the more valuable the orientator. Also, in having an instrument so closely correlated with radio, it is still more obvious that with it the usefulness and scope of radio, in turn, is materially increased.

"In the case of the automatic direction finder, which is the most advanced homing aid, the greatest value of this instrument is lost without the orientator. Many changes in headings take place prior to landing which mean little to the pilot if not associated with means for interpreting these at a glance.

But Captain Stark, like a lot of others, is finding the road to success with inventions is hard and rough.

"The difficulty lies not in getting the conception or making the smooth working and reliable device, but in getting the opportunity to convince others that it is all that is claimed for it. This should seem rather simple with a few proper connections, but it is not.

"Those who have the authority to approve or order installations of such a device know relatively nothing regarding the matter. They are too busy and their interests do not run along such lines.

"The word safety is prominently displayed on every bulletin board. Everybody talks about it; the air is literally saturated with it—but few do anything about it.

"A deplorable situation for the inventor exists in the difficulty in realizing a fair sum for his expense and work. The larger the company to which a patent is assigned, the harder it is to deal with."

Stark is having his difficulties with the Civil Aeronautics Authority—the same difficulties that thousands of flyers experience with the Civil Aeronautics Authority. The difficulties of delay, of lethargy, of "passing the buck."

"The government—what part does it play in all this?" said Stark. "Is it helpful? Yes, much help can be obtained from the government if time is not an important factor. Is it easy to get your proposition over to the right man? No. I have interviewed or attempted to interview officials of the Bureau of Air Commerce and the Civil Aeronautics Authority on the average of twice a week for the last five years, and I doubt seriously if I have contacted the right man yet."

END

Flying Ambulances

(*Continued from page 52*)

pants was found. Simultaneously, a cutter from Miami, a patrol boat from Ft. Lauderdale and a motor life boat from the Gilbert's Bar Coast Guard station stood by to give aid if needed. When the planes failed to locate the missing shark boat it was decided to drag in the 20 fathoms of water where the missing craft was last seen. Finally the cutter snagged some object thought to be the sunken boat. It was lost, however, in attempts to lift it to the surface.

Coast Guard pilots fly during their patrol and scouting flights at altitudes where the visibility is best. On a dark stormy day the shadows change rapidly; the pilot has better visibility in his twin-engined plane by dropping down lower. A single-engined plane is flown at such altitude that the pilot can turn into the wind, usually at about 500 feet, if flying down wind; if flying cross wind at approximately 250 feet. With a twin-engined plane the Coast Guard pilot flies safely up and down wind or cross wind at an altitude of 100 feet or more.

These "air ambulance" aviators have tested all types of lights and searchlights seeking to find or develop one that would prove efficient for locating missing surface craft at night. No satisfactory source of illumination has yet been found. With visibility limited and the plane traveling at high speed the eyes of the observers cannot adapt themselves

to a shape such as the hull of a fishing boat before the hurtling seaplane has passed it. It is only on a moonlight night or when the stars are exceptionally bright and the air very clear that a small boat, say a 32-footer, is visible from one of the seaplanes at low altitude. Despite these difficulties, though, the flying Coast Guardsmen have built up a reputation for its mercy flights that is almost phenominal.

A radio message from the motorship *Sunoil* far off Miami and bound for Jacksonville stated that one of the crew accidentally had had both hands severed below the wrists and also suffered serious head injuries. Immediate surgical attention was essential. U. S. Public Health Service on Coast Guard request furnished a doctor for the flight. Lieut. W. L. Clemmer with the physician and crew aboard lifted his seaplane from the hangar for a flight which ultimately contacted the *Sunoil*. The pilot "dragged" the water in the vicinity of the motorship and found a long light swell running from the southeast with a light southwest cross chop and the 10-knot southwest wind causing small white caps. This was true despite the fact that the *Sunoil's* master had reported a smooth sea.

After landing, Lieutenant Clemmer examined his plane and found a slight buckle in the left main stabilizer strut. He used one of the new stainless steel type anchors as a drag. Considerable difficulty was encountered in getting the suffering 235 pound patient on board the plane. However, the plane with anchor over drifted slightly faster than the pulling boat which facilitated the transfer. After the patient was lifted into the cabin Lieutenant Clemmer took off with little difficulty. The wind force and direction with a light cross chop formed ideal conditions for the takeoff. During passage the profuse bleeding of the injured seaman was allayed by the doctor who located the severed artery and applied pressure to check the loss of blood. As soon as the plane reached Jacksonville the patient was rushed to the hospital. The doctors said that, had his hospitalization been delayed several hours longer, he surely would have died. Another credit mark on the life-saving roster of Coast Guard pilots, those courageous chaps who fly the weather-challenging "ambulances of the air."

END

Meteorologist

(*Continued from page* 41)

airline work at present who have received training in one of these two classifications. However, it will be noted that the same deficiency from an airline operator's standpoint is present; namely, the lack of training in problems other than pure meteorology.

With this thought in mind, I approach the third variation in meteorological education which a student has to consider—the commercial flight school.

A brief glance through the advertising pages of any one of the current aviation periodicals such as POPULAR AVIATION will show a large number of commercial flight schools. Of that number, however, it will be noted that only two are presenting a course in airline meteorology: the Boeing School of Aeronautics and Parks Air College.

Each school has its own approach to airline meteorology but the net result is approximately the same: the student is thoroughly trained in airline operations and flight problems as well as in airline meteorology.

The entrance requirements into the meteorological department proper are similar in that it is necessary for the student to be an engineering graduate to study meteorology at Boeing while at Parks he must be a graduate of the airline operations and executive course.

Remaining within the sphere of my own experience, I shall describe the department and training program which I direct. The first phase of this work consists of completing the operations and executive course, during which time the prospective airline meteorologist is given training in all phases of airline operations. This includes six terms of meteorological lecture and laboratory work. Completing this course (or a recognized equivalent) the student may enroll in the graduate course in meteorology which is two terms, or approximately six months in length. The graduate course is largely designed to produce efficiency and speed in the student's analytical work.

An organization is set up as nearly equal to an airline meteorological office as possible and regular airline procedure is followed. Four six-hourly maps are drawn daily (yes, one poor unfortunate fellow has to arise, construct and analyze the midnight map) from which the various types of forecasts are prepared in a manner identical with approved airline procedure. Also a forecasting service is maintained for the benefit of the flight school. The use of supplementary information and materials such as the atmospheric soundings by airplane and radiosonde is employed with the remainder of the student's time. There are one or two weekly meetings in which problems confronting the airline meteorologist are discussed.

It can easily be seen that, as a result of the two year undergraduate course combined with the six months of graduate work in advanced meteorology problems and actual practice in current analysis, a graduate of this course will have all of the qualifications which can be required by an airline. For the man who wishes to advance in the operations field of airline work, it is recommended that he give serious thought to this relatively new but rapidly growing method of training.

Let me close by stating that, regardless of the facilities which are offered, the instruction presented and material covered, it is true of meteorology as it is of any other subject that you will get only what you put into it. We who are attempting to train men in the profession can only direct your efforts; the rest is up to you.

END

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Lightplane

(*Continued from page 72*)

and, there being no oil present to cause dust to adhere to the cable, longer cable life will result. Ships making use of fairleads of phenolic composition, micarta, etc., should have these guides kept free of dirt and grease for, as the cable slides through them, it is easily and rapidly worn if grit is present. Frequent washing with gasoline will insure freedom from adhering grease and grit.

Most, if not all, lightplanes make use of 3/32 inch cable for surface controls. This is known as semi-flexible 7x7 wire. Due to the small size of this cable it is quite important that all lengths be frequently checked for a spot of rust or a few frays are much more serious than if found on larger cable. For use as rudder cable in conjunction with pedals this cable is a little light, for the pilot puts far more strain on the cable and rudder horn by bracing his feet against the pedals than ever is required by the air load. On this account it is wise to use ⅛ inch cable for rudder control if pulleys and guides will permit. Strengthening of the rudder horn and tube is recommended, especially if the tailwheel is steerable and its horn is attached to the rudder post. With such improvements the pilot can brace his feet on the pedals with all his strength without causing damage down the line. On lightplanes using cable-controlled brakes ⅛ cable is recommended for great leverages are obtainable and brakes are soft and useless if cables tend to stretch. Some of the late model lightplanes are featuring an hydraulic brake which has been quite successful. Owners are cautioned to use the fluid called for in filling the brake lines. Two types of brake fluid are in use today: a vegetable composition of castor oil and alcohol (similar to Lockheed or Wagner number 5 or 21) and a mineral oil similar to Stanavo No. 9. Special synthetic hose and seals are required to handle mineral fluid, as it will swell and deteriorate natural rubber. Vegetable oil, however, can be used in a system built for mineral oil without ill effect although the mineral oil is superior, especially for hot weather use, or where the brakes are often used.

The matter of instruments for the lightplane is one that is being recognized more fully by the manufacturer, as can be easily seen by examining any of the later ships. Instruments are an essential to properly controlled flight and, while it is not always possible for all owners to equip their ships with the latest or the best, it will be found valuable to install a good airspeed, altimeter and—if funds permit—a turn and bank indicator and a good compass. One of the well-known instrument companies manufactures a line of moderately-priced aircraft instruments which fill the bill for light aircraft use. As many of the lightplanes feature an instrument panel which is rigidly fastened to the structure and which vibrates considerably, it is wise to install a shock-mounted panel if a comprehensive instrument installation is planned. While not an essential, a shock-mounted panel will save vibration being transmitted to the more delicate instruments and thus lengthen their life and accuracy. If space is a consideration the flight instruments alone can be mounted on a small shock mounted panel in the center of the board.

Compass location on the lightplane is a matter to be given some thought. Try the compass in several locations, with the ship in flying position and engine running, to determine the favorable spot for mounting, where the least compensation will be necessary. Also move all controls, both engine and plane, for many times it will be found that even the slight movement of controls will throw the compass off many degrees.

It can easily be seen that, with a little thought, a lightplane can furnish as much value to the owner as one of its larger brothers and, with frequent attention, it can be just as safe and economical (in some cases more so) than comparable means of transportation in other fields—with the addition of many inherent values that others lack.

END

Winter Rendezvous

(*Continued from page 44*)

headquarters and the cold weather expedition, whether it was in the air or encamped on the ground, was maintained by two-way radio, using the B-17 as a radio station.

The B-10B from Wright Field carried a miscellaneous assortment of experimental equipment, including exhaust-driven turbo superchargers on its Wright *Cyclone* engines.

This year's test came just 14 years after the first cold weather equipment test conducted by the Air Corps, also at Selfridge Field. In February, 1925, a squadron of Curtiss pursuit planes, accompanied by two DeHavilland observation ships and two Martin bombers, all under the command of Maj. Thomas G. Lanphier, commanding officer of the First Pursuit Group, spent a week camped on Lake Van Etten, adjacent to the Camp Skeel gunnery range testing aircraft and armanent efficiency under adverse conditions. The lake was frozen, of course, and all planes were equipped with skiis.

Similar "arctic" expeditions were conducted intermittently in subsequent years, terminating with the famous cross-country grind to Seattle, Wash., under Col. Ralph Royce, in 1935, with a squadron of Boeing J-26's.

In 1937, skiis were ruled obsolete, and all operations were conducted on wheels. In this day of retractable landing gears, skiis are utterly useless and modern tactics require operations from prepared air bases.

But there will always be problems attendant to cold weather operations—and Selfridge Field crewmen feel they will always be called upon to tackle them.

END

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BEECHCRAFT, 1937, 285 Jacobs, little time, floats, two doors, radio, just majored. Write, Babb, Glendale, Calif.

BELLANCA CH, Wright J-5, good payload, six-place, $1400. Chas. Babb Co., 1140 Airway, Glendale, Calif.

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MISCELLANEOUS AIRCRAFT

GREAT LAKES, Airwheels, Brakes, refinished, just relicensed, good group of instruments, $995. Babb, Glendale, Calif.

HAMILTON, Hornet, Airwheels, big payload, lights, extras, excellent condition, recently overhauled. Babb Company, Glendale, Calif.

KINNER, Sportster, Kinner K-5, wings just recovered, fuselage excellent condition. $1150. Chas. Babb, Glendale, Calif.

LOCKHEED VEGA, Wasp C-1, recently airline overhauled, just refinished by Charles Babb, Glendale, Calif. Priced $4500.

LUSCOMBE Phantom, late 1936, Warner 145, radio and extras. Babb, Brooklyn Office, Floyd Bennett Airport.

LUSCOMBE Phantom, 1937, Warner 145, 150 hours total, sensitive altimeter. $4000. Babb Co., Glendale, Calif.

STEARMAN, C3B, J-5, refinished, wings beefed by Babb Company, excellent condition. $1250. Babb, Glendale, Calif.

STEARMAN, C3R, Wright J6-7, engine modernized, wings beefed and recovered. Bargain at $1550. Babb, Glendale, Calif.

FOR SALE: Special Szekely Eaglet $575. Used parts—Aeronca C-3 Cub and Szekely. B&F Aircraft Serv. & Acces., Harlem Airport, Oak Lawn, Ill.

FLEET, Model 1, Warner engine, brakes, starter, beautiful. R. T. Bernard Airport, Youngstown, Ohio.

SALE OR TRADE. Curtiss Junior, new prop, landing gear, 200 hrs. on motor. F. G. Clark, Rockport, Ill.

FOR SALE: Arrow Sport Biplane, Leblond 65. 2 place, licensed, $375.00 cash. Laura Cameros, Concord Road, East Acton, Mass.

DEALER for Stinson and Cubs. Authorized dealer for Continental motor parts, used airplanes, all kinds, all prices. Camel City Flying Service, Box 1941, Winston Salem, N. C.

FOR SALE: One 1939 Cessna Air Master less than three months old and approximately 50 hours. Never scratched. Navigator lights. Retractable landing lights. Flaps. Bank and turn indicator. Rate of climb indicator. Red hand-rubbed finished paint. Will take $1,800.00 less than original cost for quick sale. Write or see W. J. Evins, Smithville, Tenn.

LIGHTPLANE, less motor and airwheels, brazed steel fuselage, always hangared, never cracked, excellent condition, one place, photo dime. W. J. Fike, Pavillion, Wyo.

SINGLE SEATER with motor nearly complete $125.00. James W. Hinson, 238 Springdale, Athens, Georgia.

PORTERFIELD 1935 70 LeBlond. Fast, Economical, Attractive. Max Jones, 3496 Adams, Ogden, Utah.

WARNER-COMMANDAIRE. Sell or trade for Lightplane just overhauled, recovered, $850. J. L. Justice, 1001 S. Main St., Lexington, N. C.

EAGLEROCK-WRIGHT J4-220. Just relicensed, 120 hrs. on motor since major. Brakes, tailwheel, speed ring, new prop. 53 gals. tanks. Color blue, red-white trim. $1000 or trade on smaller 3 place. Part OX mtr. mt., radiator, cowling, center section, upper right wing damaged. 3 place Swallow tail surfaces, ailerons, wires. J. Krivis, 920 N. Hoyne Ave., Chicago.

SALE: Golden Eagle, Rib material cut to requirements. Wanted Salmson AD-9. Ray Martin, Sterling, O.

SIKORSKY S-39, ship and motor just major overhauled, $6500. Monterey Airways, Monterey, Calif.

LOCKHEED VEGA, recent factory major overhaul, Radio, controllable prop. Best available. Monterey Airways, Monterey, Calif.

FOR SALE: Exceptional "Baby Ace", Salmson powered, trade for motorcycle. Edgar McCarter, Union City, Ind.

SALE OR TRADE: Siemens Commandaire. Just licensed. Want Ryan or Robin. Mgr. Airport, Hot Springs, Ark.

CIRCULATION

63,054 A.B.C.

In this classified advertising section POPULAR AVIATION offers its readers the widest market available in aviation. It presents a most effective means of bringing prospective buyers in contact with those who wish to sell. POPULAR AVIATION is read by everyone interested in aviation. Your ad in these columns will reach the right market. And it's really economical!

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Address: Classified Department:

POPULAR AVIATION
608 S. Dearborn, Chicago

SALE: J-5 Standard, 40 and 50 H.P. Taylorcrafts, 1934 Aeronca. Particulars, Ed. Nibur, Bernharts, Pa.

WACO GXE. Lic. 50 hrs. on new motor. Ship perfect; $300 cash. W. Vaughan, 6323 Cottage Grove, Chicago, Ill.

TRADE: Snipe class, racing sailboat, for licensed 2 place open job. Bob Potbury, Fenton, Mich.

USED AIRPLANES. All makes, open, cabin, send for free list. Pioneer Sales, Airport, Syracuse, N. Y.

FORD LIGHTPLANE $200.00; Gee-Bee Tail Group $25.00. Ervin Quinn, Roebuck, S. C.

HEATH, almost complete, motor in A-1 condition, $90. John Suther Jr., Brumley St., Concord, N. C.

HEDGE-HOPPER, 20' span, low wing, Harley powered. Truman Smith, 628 N. 23rd, Allentown, Pa.

36 HARLEY CHIEF, side car and extras for airplane. 3122 Gray Place No., Mpls., Minn.

PERFECT 1937 Ford 60 Tudor for licensed lightplane, full or part payment. Lawrence Thurlow, 100 NE Union Ave., Portland, Oregon.

ENGLISH AVIAN flying. Sell to best bidder. John Thurmon, LaGrange, Ky.

FOR SALE: "Baby Ace" Salmson motor, $300.00 or trade for car. Treaty Airport, Greenville, Ohio.

HEATH, $50 complete; 1936 Aeronca C-3, $400; Flying Flea, less motor $30; OX-planes $100 up flyaway, over 100 others located everywhere. Complete Directory, 25c postpaid. Used Aircraft Directory, Athens, Ohio.

PHEASANT Cabin Monoplane, unfinished. Sell or trade. Frank Werner, 2972 N. 6th St., Milwaukee, Wisc.

GOOD HEATH and Harley for biplane late Harley or open car. Lester Brandt, Paola, Kans.

TRADE: Indian Scout 1930, 45 cu. in. for lightplane. Edwin White, Sinks Grove, West Virginia.

AIRPLANES WANTED

WANTED: Ford A Pietenpol, Heath, or C-2 Aeronca. Good condition. Carl M. Boore, McCune, Kans.

WANTED: For cash, licensed Cub or Aeronca. Andrew Bugel, Newport Ave., Alden Sta., Penna.

WANTED: 50 H.P. Lightplane. Deliverable at Los Angeles. R. R. Barnes, Boron, Calif.

WANTED: 50 H.P. seaplane—good condition. Must be reasonable. Wm. Birch, 6906 Capitol, Houston, Texas.

WANTED: Autogiro with or without motor. Write V. G. Camm, 124 Traymore, Willoughby, Ohio.

WANTED: Heath-Russel-Lincoln sportplane with or without motor. A. Clark, 9019 214 Place, Queens Village, N. Y. C.

WANTED: Licensed lightplane in good condition. Cash. Arthur Carlson, 80 Falconer, Jamestown, N. Y.

WANTED: Plane under $1500 or reasonable priced OX or lightplane, licensed or unlicensed. Also light motor. C. J. Dry, Athens, Ohio.

WANTED: Licensed lightplane or Flea ship. Bob Devoe, Lodi, O.

WANTED: Licensable Heath Parasol in repairable condition. James Dean, 2384½ Teviot St., Los Angeles, Calif.

WANTED: Licensed dual-control used plane. Send particulars and pictures. Chuck M. Darcy, Kalispell, Mont.

CASH for good OX Travelair or Bird. Kinner Fleet, Great Lakes, or Warner job, if price is right. S. Dinnin, 2234 N. New Jersey, Indianapolis, Ind.

WANTED: Harlequin, Aeronca, Continental, airwheels, parts. State price. J. R. Edwards, 126 D St., Salt Lake City, Utah.

SEND YOUR PRICE LISTS on airplanes, blueprints, kits, gliders, etc. Flyair Aviation Club, Fredonia, Kansas.

WANTED: Licensed OX Travelair or similar ship under $400. Olav Fostervold, Camp 2770, Red Wing, Minn.

WANTED: Lightplane, used—will buy or trade good car. Robert Grigsby, Marked Tree, Ark.

WANTED: Aeronca, Cubs or other lightplane crackups or parts. C. D. George, Roebuck, So. Carolina.

WANTED: Small Pitcairn autogiro any condition. Wm. Hilburg, 500 Southern Blvd., N. Y. C.

WANTED: Lightplane needing rebuilding. Aeronca preferred. Trade Ford Roadster, airwheels, new top. Walter Johnston, Bells Landing, Pa.

WANTED: Cheap—cash—licensed Heath or Aeronca Scout. William Jeffries, Kirmar Ave., Alden Sta., Penna.

WANTED: Pietenpol, American Flea, Heath Parasol or other lightplane. Jack Kettler, Manville, Wyoming.

WILL PAY CASH for cheapest plane answered; must be flying. Dick Kaiser, Paola, Kansas.

WANTED: Best biplane under $200; must be flying. Nadyne Kohler, 6717 Paseo, Kansas City, Mo.

WANTED: Economical operating plane. Good condition. Licensed. Cheap. Dar Kindred, 202 California, Reno, Nev.

WANTED: Model LN Heath parasol. Prefer factory job. Cheap for cash. Paul Kelly, Ridgeway, O.

WANT licensed or unlicensed lightplane in good condition, also seaplane. Vernon Lewis, Mora, Minnesota.

WANTED: Good used P.T. or Primary Secondary Glider. Rob't Miller, Dassel, Minn.

WILL GIVE $300 for Licensable ship. Al Minor, 58 W. State, Battle Creek, Mich.

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WANTED: Lincoln or Gere sportplane. Motors, 30 to 70 H.P. Ervin Martin, Sterling, O.

I HAVE $125 CASH for lightplane. Chester L. Oclom, Selma, Indiana.

WANTED: Lightplane, bargain; state your price in letter. Alfred Poole, 25 Bartholomew St., Peabody, Mass.

LICENSED LIGHTPLANE. Valuable things to trade. Send picture, details; will send list. Frank Ryktarsyk, 7787 Archdale, Detroit, Mich.

WANTED: Rearwin, Fairchild 22 or similar airplane. Crackups considered. Oscar Sagli, Box 152, Cheyenne, Wyoming.

WANTED: Cub Seaplane or similar craft. William Spicer, Cherryplain, N. Y.

WANTED: Wiley Post Biplane. Must be licensed and cheap. Gordon E. Swann, Box 234, Refugio, Texas.

WANTED: Curtiss Jr. In flying or repairable condition. Norman Teigen, 1240 Dorothy Drive, Glendale, Calif.

WANTED: Pietenpol Air Camper or parts. D. Vos, 890 Fuller Ave. N., Grand Rapids, Mich.

WANTED: Cracked up Fairchild 24, suitable to rebuild. Have cash. Alton Walker, Airport, Monterey, Calif.

AIRPLANE PARTS

PRICED LOW: Two new 24x4 tires. Instrument panel including Tachometer, oil gauge, Altimeter, Eaglerock combination wings, Radiator. Arthur Becker, Brockton, N. Y.

CYLINDERS, new Wasp C-1-D type, $95 each. Discounts on quantity lots. Babb Co., Glendale, Calif.

CLEARING OUT: Aeronca C-3 Wings, Fuselage, Struts, Flying Wires, Landing Gear, Wheels, etc.; Aeronca Engine, every part you may need, Eaglet Wings, Fuselage, Tail Group, etc.; Szekely Engine, all parts. Write for Low Price List. Box No. 56, Popular Aviation, Chicago.

SALE of Motor and Accessory bargains: Eclipse Series 6 Hand Inertia Starters $20. Carburetors for all engines, $25. New 29x13-5 Doughnut wheels with tires, $25 each. Tachometer shafts 15' to 30' at 10c ft. Steel Propeller Blades up to 250 H.P. $35 each. Steel Propeller Hubs up to 300 H.P. $20 each. P&W Hornet A2 Engine complete $400. P&W Wasp B engine complete $150. Propellers Wasp-J6 $75. Anzani 10 cylinder 90 H.P. $125. Anzani 6 cylinder 45 H.P. $75. Cirrus Mark II almost new $150. Box No. 57, Popular Aviation, Chicago.

WANTED: Complete airspeed indicator and Pioneer or Pathfinder compass. Must be priced low and in good conditon. Jack Bright, Lehighton Airport, Lehighton, Penna.

FLEET FLOATS model 1835 almost new, special heavy duty bottoms, extra re-inforced keel; a real buy for operator intending to do instructing. Brand new strut gear and fittings; a factory guarantee goes with these floats; price $860. Box No. 55, Popular Aviation, Chicago.

FLOATS for a J2 Cub, model 1070 floats like new throughout with full factory guarantee; complete with struts and fittings ready to install; used very little; a real buy at $475; a saving of over 25%. Box No. 54, Popular Aviation, Chicago.

RADIO beam receiver; bargain; brand new RCA model AVR-7B and AVR-7C; list $149.50; priced for quick turnover at half price, $75. All necessary equipment included complete with shock mounting. First orders in filled while they last. Box No. 58, Popular Aviation, Chicago.

STATES B3 WINGPARTS and tail surfaces. O. B Collins, 1706 N. Division, Salisbury, Md.

FOR SALE: Used leather Flying suit, Wilson goggles, and Hartzell Ox Prop. Write for prices. Vinson Casey, Sidney, Montana.

A EAGLE FUSELAGE, cowling, wings. I want OXX6 prop. Doyle Cotter, 219 Bennett, Mt. Pleasant, Mich.

WANTED: Motors, Irvin, Cleone, Heath; 700x4 tires, tubes, props, supplies. H. H. Gerlach Jr., 118 Madison Ave., Clifton, N. J.

WANTED: Arrow Sport Fuselage and Landing gear. Good condition. Geo. E. Goodhead Jr., 1320 So. Louisville, Tulsa, Oklahoma.

WANTED: Skis for Heath. F. Klemas, 1416 E. 3rd St., Ashland, Wisc.

WILL PAY $35 for certificated parachute. Mark Knisley, 881 N.E. Capitol, Battle Creek, Mich.

FILTERS for satisfactory reception; CAA simultaneous transmissions; $22.85; COD. Lewis Aircraft, 5023 Manett, Dallas, Texas.

FAIRCHILD KR-31 (Challenger) parts. Write for list. Millerized OX-5. Mellinger, 309 S. 40th, Philadelphia, Pa.

WANTED: Menasco A-4 parts. Will pay cash. Al Newburg, Box 449, Westport, Ore.

FOR SALE: Pioneer altimeter, good condition, 20,000 feet, rotable, $16.00. Oak Air Service, Foley, Alabama.

HIGH SPEED CARBURETER 75c: trade in. Prodehl, 1423 Clement, Joliet, Ill.

WANTED: Set of licensed OX5. Robin wings covered. Ted Phillips, 603 Grace Ave., Burlington, N. C.

SALE OR TRADE: New Mead countershaft $5. New 4-ft. prop $1.50. Desire gas model motor. Harold Peterson, Wibaux, Montana.

$135 TAKES Switlik white silk, chest-back, training parachutes. Florence Stewart, Professional Building, Elgin, Ill.

WANTED: Irvin seat pack chute, good condition. Reasonable. Russ Walling, Watertown, N.Y.

IRVIN WHITE silk exhibition set, good condition; $125 cash. C. J. Zimmermann, 714 No. Broadway, Milwaukee, Wisc.

ENGINES

WRIGHT R975-D's, overhauled and modernized by Wright factory agency. $1350. Chas. Babb Co., Glendale, Calif.

WASP C's, overhauled and modernized by P&W service agency, guaranteed. $1650. Babb Company, Glendale, Calif.

WRIGHT R760-D, overhauled and modernized by Wright factory agency. $1000. Babb Co., Glendale, Calif.

WANTED: Kinner K-5 engine needing overhaul. Box No. 157, South Tacoma, Washington.

COMPLETE STOCK new and reconditioned Pratt & Whitney and Wright parts. Babb Co., Glendale, Calif.

ATTENTION: New Szekely. Parts. 40% to 70% off list price. Harold Bothwekk, Griffith, Ind.

WANTED: Salmson motor parts. Reply. T. L. Gammage, Hampton, Va.

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FOR SALE: Overhauled Lycoming engine $290. Wm. Leithold, 4405 46th Ave., So. Minneapolis, Minn.

$40 TAKES 60 H.P. ANZANI motor. Frank Van Duzer, 1017 Porter, Waukegan, Ill.

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HAMILTON-STANDARD adjustable Wasp propeller, overhauled. $175. Chas. H. Babb Co., Glendale, Calif.

HAMILTON-STANDARD adjustable propeller for J6-5-7-9, overhauled. $135 and up. Chas. Babb Co., Glendale, Calif.

FOR SALE: Standard Steel Prop for J-6. Few hours since etched, polished. Box No. 157, South Tacoma, Washington.

SALE: Hamilton Steel Propeller Blade and Hub. 100 H.P. Al Newburg, Box 449, Westport, Ore.

PROPELLERS: All types, including three blade airliners, for sleds, more attractive, greater efficiency and maneuverability. Special introductory prices. List free. Universal Aircraft Company, Ft. Worth, Texas.

WANTED: Used prop. for 35 H.P. Anzone. D. A. Warren, 2228 Murphy, Joplin, Mo.

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AIRCRAFT BLUEPRINT and layout course, $1 per lesson. Craft School, Box 687, Santa Monica, California.

AVIATION APPRENTICES: Training for entering Aviation as Apprentices—write immediately, enclosing stamp. Mechanix Universal Aviation Service, Wayne County Airport, Dept. B21, Detroit, Michigan.

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MEAD GLIDER, licensed and in excellent condition. $100.00. Air Activities Airport, West Chicago, Ill.

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SALE: Back issues Model Airplane News, 1935 to 1938 inclusive. Write Carl Gerdes, Erie, Ill.

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ICEBOAT PROPELLER and 50' aircraft seamless tubing. Reasonable. Spangler, 34 Florence Ave., Greece, N. Y.

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6½' HOWARD DGA-8 gas model. Never used. Beautiful job. Write. Rob't Russell, Amityville, L. I.

SALE: Curtiss Robin Gas Model. Brown powered. Allen Turbeville, 6 Leonard Rd., Hingham, Mass.

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PATENTS: Low cost. Book and advice free. L. F. Randolph, Dept. 372, Washington, D. C.

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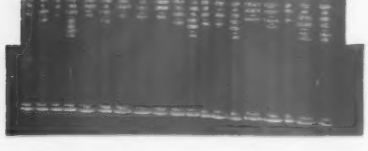

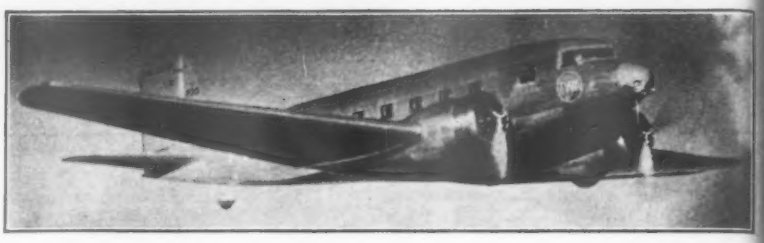

Just Published:

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Member, Institute of Radio Engineers;
Chief Instructor in Aircraft Radio, Stewart Technical School

500 Pages, 198 Illustrations, $4.50

RADIO has become a vital factor in the successful operation of aircraft. A radio operator's license must be held by all pilots desiring the instrument flying rating now required of airline pilots; many ground men, too, are required to possess this license. The application of radio in aeronautics is constantly growing, the field offers splendid opportunities for interesting and worthwhile employment.

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WRITTEN to help its users meet the latest government requirements—*the Civil Air Regulations issued May 31, 1938*—this new book supplies in detail the flight training instructions needed by beginners and also by pilots, already proficient, who aspire to higher grades. In addition it will be helpful to flying instructors and to pilots who want to obtain the instructor rating. It brings you the cream of what the author has learned in training hundreds of pilots in his twenty years of continuous experience. It is designed for use as a text in primary and advanced courses given at flying schools, and as a practical guide for pilots who wish to attain greater proficiency in precision flying.

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